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ELECTRICAL WORLD

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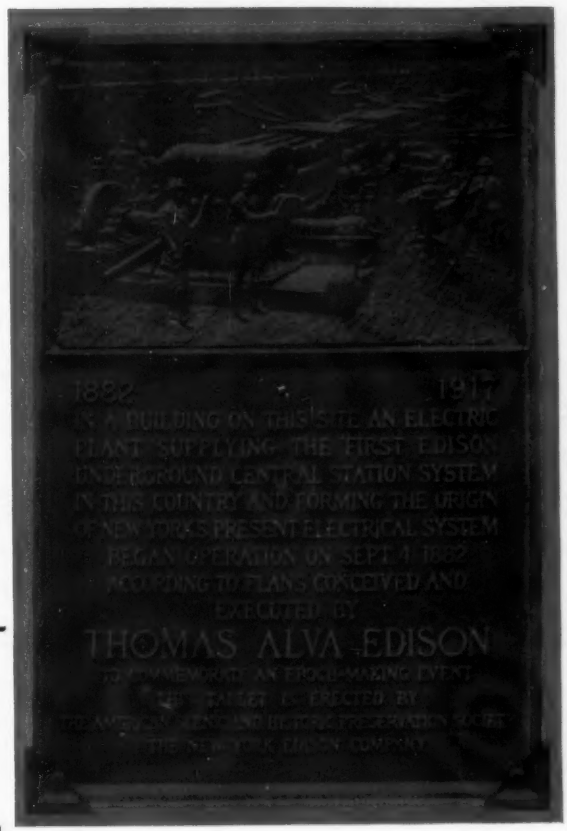


Tomorrow—the 50th Anniversary

● Pearl Street station, forerunner of the present lusty utility industry, brought into being the associated manufacturing, sales and service industries, now collectively ranking with the iron and steel, railroad, automobile and food industries . . . Livelihood for a million employees and sustenance for industries supplying fuel, raw and fabricated materials, machine tools, shop and office equipment, automobiles, etc., are afforded by this electrical group.

● Complete transformation of industrial, commercial and domestic life resulted . . . Work made more enjoyable through better working conditions and electric "slaves" . . . Business aided in reducing production costs and paying higher wages than anywhere else in the world even now . . . Homemakers, urban and rural, given comforts never dreamed of before . . . Railroad transportation gradually being transformed.

The Future—what it holds!!

● Recognized authorities in their particular fields will discuss business opportunities in the October 1 issue of Electrical World . . . Fundamental factors and technological developments have been slowly unfolding for the past three years, unrecognized by most people . . . They will be cited . . . On these foundations a glorious future can be erected — IF — business men will acknowledge their soundness and adapt their activities thereto.

● Topics will include — business, social and economic aspects — influence on business of scientific developments and research — possible new applications of light, power and heat — manufacturing and sales — and such functions as production, distribution and control of energy . . . The near and distant future which may be expected in view of fundamental forces and developments will be visualized . . . It is largely within the control of business men.

Does your production problem involve

SPEED · · COLOR
NOISE · · LIGHT
TEMPERATURE
FRICTION · · TENSION
MECHANICAL VIBRATION · VISCOSITY

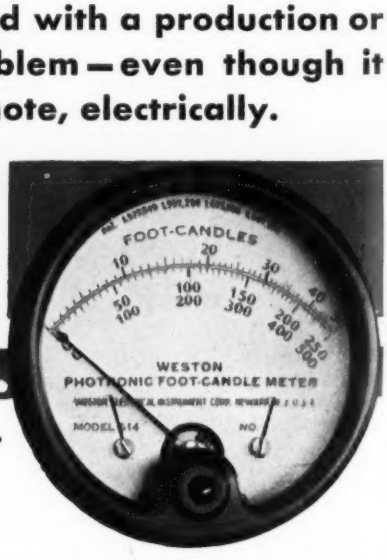
● Many manufacturers have found a permanent, reliable and economical solution to some of their most perplexing production and inspection problems in an application of electrical measuring instruments.

Today, even *non*-electrical quantities are measured reliably and accurately by electrical instruments, calibrated in secondary values.

In many plants, their application has injected simplicity, cut costs, eliminated human error, improved uniformity and quality of the product. They have made possible a closer, more reliable control; effected savings in time, labor and materials. And all for a very low cash outlay!

So far-reaching have been recent developments of electrical measuring instruments, we suggest you call a Weston representative when you are next confronted with a production or inspection problem — even though it may seem remote, electrically.

WESTON
ELECTRICAL INSTRUMENT CORP.
578 FRELINGHUYSEN AVENUE NEWARK, N. J.



Outstanding among the recent developments of the Weston Laboratories is direct-reading FOOT-CANDLE METER. It is made possible by the Weston PHOTRONIC photoelectric cell—the most advanced, trouble-free type known to science.

ELECTRICAL WORLD

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for the Week Ending

September 3, 1932

Electrical Industry Leaders Active in Recovery Program

PATTERNED somewhat after wartime Liberty Loan campaign organizations, a nation-wide drive enlisting the co-operation of the nation's business leaders was launched last Saturday by President Hoover in a new offensive against the depression. At a conference of representatives of business and industrial committees of each of the Federal Reserve districts President Hoover called upon the conference representatives to organize for action to enable them to "join in stimulation of organized private initiative in America." Electrical industry men have been included in key positions.

"The reason for calling this conference at this particular moment," Mr. Hoover said, "is that we are convinced that we have overcome the major financial crisis and that with its relaxation confidence and hope have reappeared in the world. The problem before this conference is not to settle great questions of the future or to establish artificialities, but rather by practical steps today, or organization, to make effective the activities of every agency which can promote the recovery of the nation."

Six-point program adopted

A program action has been adopted by committees covering: The making of credit useful to business; increased employment and stimulation through expansion of maintenance and purchase of new equipment; expansion of capital expenditures; a work-sharing movement; house repair and improvement efforts, and an organization to assist home owners with maturing mortgages.

Owen D. Young, chairman of the board of the General Electric Company, is chairman of the committee which will tackle the problem of making available credit affirmatively useful to business.

A. W. Robertson, chairman of the board of the Westinghouse Electric & Manufacturing Company, is chairman of the committee to promote the expansion of capital expenditures by industry in the way of replacement of obsolete and worn-out equipment. Included on Mr. Robertson's committee are John E. Zimmermann, chairman of the board Philadelphia Electric Company; J. S. Tritle, vice-president Westinghouse Electric & Manufacturing Company; R. F. Pack, president Northern States Power Company, and Malcoln Muir, president McGraw-Hill Publishing Company, Inc.

Mr. Young said, in part: "If we succeed even in small measure in this undertaking, and can do it before the winter comes, I think these committees will have rendered a very great service to business in the United States. And not only to business, because that is secondary, but to men and women who need food and shelter, and most of all who need to retain their own self-confidence and self-respect."

Mr. Robertson states: "Financial and credit affairs are clearly and positively better. In fact, it might well be said that whatever weaknesses there were in the financial situation have been corrected or are in the process of being cured."

This Week

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Refrigeration Bureau to continue says, Davidson — p. 294

New utility issues in August $62,427,000 — p. 294

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Customers' dividend up in Hartford — p. 293

Electric construction costs continue rise — p. 295

Alabama Commission wants more regulatory power — p. 292

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Pennsylvania Electric Ban Lifted by Commission

Pennsylvania Securities Commission has rescinded its order of last week prohibiting the sale in the state of certain bonds of the Pennsylvania Electric Company. The rescinding order was based upon evidence that the proceeds of the bonds were not to be used in the purchase of the Clarion River Power Company property. The bonds affected were the first and refunding mortgage gold bonds, series H, 5s, due 1962.

The original order of the commission against sales of the bonds involved the inquiry being made by the Securities Commission into alleged violations of the state law by the Associated Gas & Electric Securities Company, Inc., which is a part of the Associated Gas & Electric system, and of which the Pennsylvania Electric Company is a part; the

Securities Commission's investigation into the acquisition of the Clarion River Power Company, and the action of the Federal Power Commission's inquiry into the Clarion River deal.

Conferences last week at Harrisburg between representatives of the Federal Power Commission and the Pennsylvania Public Service Commission resulted in definite action relative to the financial conduct of the Clarion River Power Company, a licensee under the federal water-power act, following the report of the purchase by Pennsylvania Electric of Clarion River property. The Federal Commission adopted three orders—one making an unqualified demand upon the Clarion River Power Company for facts, requiring it to file within ten days a complete report on the purported sale of its property to the Pennsylvania Electric Company, another ordering the Clarion River Power Company not to issue or sell any securities without prior approval by the Federal Power Commission and the third serving similar notice upon the Pennsylvania Electric Company either as customer or successor of the Clarion River Power Company.

The Securities Commission had announced no change in its order forbidding the sale in Pennsylvania of Associated Gas & Electric eight-year bonds due in 1940.

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Defiance Injunction Stands

The temporary injunction secured by Defiance, Ohio, to block the Toledo Edison Company in its endeavor to prorate charges for electric and gas service in that city (ELECTRICAL WORLD, August 20, page 232) has been made permanent. Common Pleas Judge Openlauder ruled that the company must render a bill on the regular-monthly rate. The decision will, it is reported, be appealed.

▼

Louisville Gas & Electric Sued for Back Taxes

In order to collect $1,000,000 or so alleged to be due the state of Kentucky by the Louisville Gas & Electric Company suit has been filed by the state revenue agent.

It is alleged that tax collections on franchise valuations were omitted for the years 1927-1931 inclusive .and the court is asked to fix a franchise valuation for each year for the purpose of levying the allegedly unpaid taxes.

Similar action was previously taken in the case of the Kentucky Coke Company, owned by Louisville Gas & Electric. About $1,500,000 was involved there.

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League Would Revive Old Jersey Ordinance

Action to revive a twenty-year-old ordinance authorizing construction of a municipal power plant has been undertaken in Camden, N. J., by the recently organized Public Utilities Consumers' League of New Jersey.

Agitation to force the city commissioners to act is said to be planned. The ordinance authorized a $300,000 bond issue for construction of the plant, according to Edward West, counsel for the protest body, which has been characterized as an outgrowth of resentment against rates imposed by the Public Service Corporation for electric power and gas in New Jersey.

The league charges that rates are entirely too high, and eyes with suspicion the silence of the Public Utilities Commission, which is supposed to set rates.

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Washing Machine Patents Granted to Maytag

The Maytag Company, manufacturer of electric washing machines, has been granted the patent rights on bottom agitation in washers, the basic principle of which is now used by practically all of the important manufacturers of washing machines. The patent has been in dispute for ten years or so. Maytag is now negotiating license agreements permitting other washing machine manufacturers to use the patent on a royalty basis.

In a letter sent to all washing machine manufacturers the company asks for a royalty of 5 per cent on the quoted list price of all "washers using a high center post, running above the water line." In addition, the company demands control of prices to dealers and distributors.

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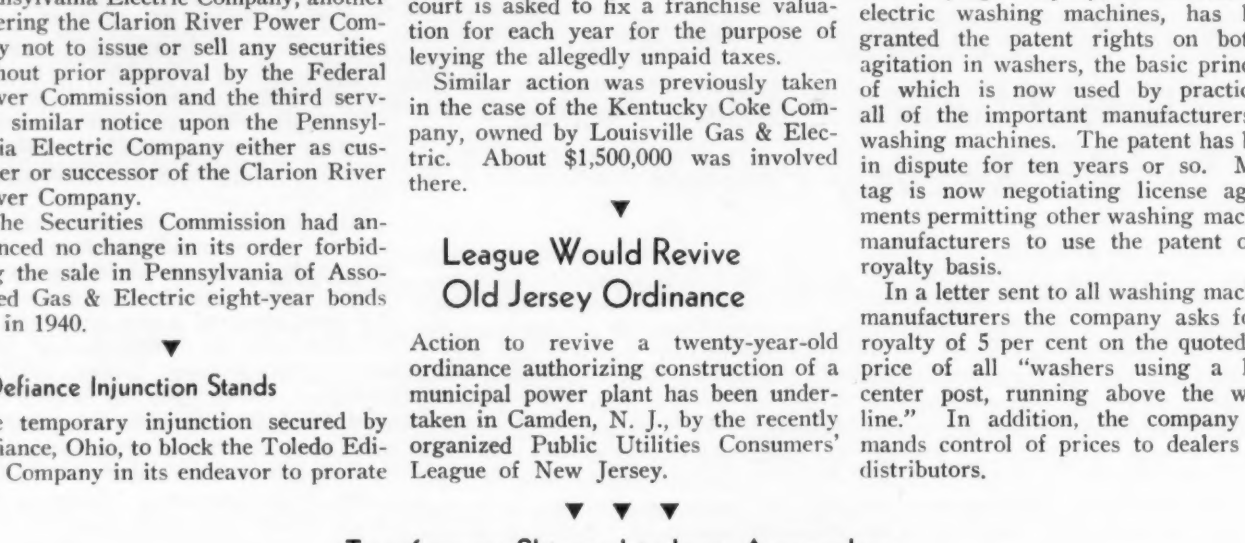
Transformers Shipped in Inert Atmosphere

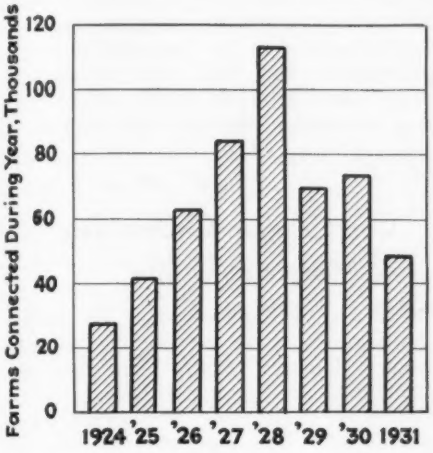


This 260,000-lb. capacity General Electric transformer car is designed to facilitate the shipment of transformers by that organization. By filling the tank with gas after loading the transformer moisture accumulation and the necessity for subsequent bake-outs is eliminated. The new car, with the exception of the trucks, is of welded construction and is said to mark a departure in car design. More than 5,000 feet of welding is involved.

The car, 60 ft. long and 10½ ft. in width, is provided with two lifts, one of 2 ft. and the other of 3½ ft. Its height above the rail, without either lift, is 10 ft. With the lifts, its height is 17 ft. The tank is constructed of steel, $\frac{7}{16}$ in. thick, welded to stand a gas pressure of 5 lb. per square foot. A second car is in process of construction.

Farms Electrified; Push Use of Energy

Rural and farm electrification progress is covered for the decade of 1921-1931 in the report, just issued, of the N.E.L.A. rural electric service committee. Clearly indeed, as shown in the accompanying chart, is there a slowing down in the rate of adding customers and future efforts here must be devoted



to the development of the more intensive use of electrical energy and service rather than upon any generally profitable extensions to untapped areas which may produce more customers.

The report shows the number of farm customers to have grown from 177,561 at the beginning of 1924 to 698,786 at the end of 1931, an increase of 521,225, or 293 per cent, averaging 65,150, or 36 per cent, yearly for the eight-year period. In 1931 about 48,000 farm customers were added.

According to a report of the Bureau of the Census, 845,356 farms, or 13.5 per cent of the total number of farms in the United States, had electric service as of April, 1930. Of this number, 249,342, or 4 per cent, had individual plants and 596,014, or 9.5 per cent, were being served by electric light and power companies.

At the mid-year 1932 there were approximately 1,000,000 farms with electric service from power companies and individual plants and 1,000,000 other rural customers outside of incorporated cities and villages. Based on the Bureau of the Census definition of rural territory, which includes all areas outside of towns of over 2,500 population, the total number of customers served in rural territory is now approximately 4,000,000.

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Hudson, Mass., to Modernize

A fourth Diesel engine generating unit has been ordered by the municipal lighting department of Hudson, Mass., in connection with the expenditure of about $81,000 to modernize its generating station. The new unit will be a 1,200-hp. engine generator, and its cost will represent about 60 per cent of the betterment expenses in the plant, which will have a rating of 3,675 hp. when this unit is added.

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Wire Troubles from Trees Reduced by Boston Edison

A decrease of 59 per cent in the number of wires down per 100 street-miles of lines per year has been attained by the Edison Electric Illuminating Company of Boston in the past five years by the use of modern tree surgery. In 1931 the company's distribution lines traversed 2,111 miles of streets and there were but 125 cases of wires down on account of trees compared with 272 such reports in 1927.

Due to these efforts the troubles per 100 street-miles fell from 14.3 to 5.9. In 1927 the company paid $51,564 to tree surgeons for line clearing and $93,433 in 1931, whereas its own labor costs in this work were reduced from $30,336 to $4,378 in the period. In 1931, 91 per cent of the street mileage on the system was under the jurisdiction of tree-trimming organizations, and the company's grand total cost for line clearing was $104,221, as compared with $115,505 in 1927 for 1900 street-miles. In nearly all the municipalities served by the company the public has welcomed the use of commercial tree surgery as a feature of line maintenance.

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New Electrical Code to Be Issued Next Year

According to a recent announcement by A. R. Small, chairman of the electrical committee of the National Fire Protection Association, the next edition of the National Electrical Code will be issued in 1933. Under the procedure of the committee changes in the code must be reported upon by the appropriate article committee before the full committee can consider them unless this requirement is waived by unanimous consent of those attending the meeting of the full committee.

It is expected, according to Mr. Small, to have the reports of most of the article committees ready for publication in December, 1932, so that they can be studied prior to the meeting of the electrical committee soon after March 15, 1933. He points out that persons or organizations desiring to have changes in the code considered should present them to the proper article committee before October 1.

Spending the Way Back to Prosperity

REDUCED to essentials, the hopes of America for resumption of economic health under artificial stimuli lie in the possible successful outcome of large-scale efforts to force commodity prices up and the purchasing power of the dollar down to the point where the present all-but-overwhelming burden of private and public debt can be stabilized upon the basis of the deflated dollars in which most of it was incurred. In this post-war collapse no other nation has succeeded in similar efforts.

To accomplish recovery the homeopathic principle of like curing like is being applied. Suffering from debt industry is urged to incur additional increments through eased credit status. Can we "Buy now and spend the way from poverty to prosperity"?

Security and commodity markets still reflect the strong psychological reaction from earlier depression thinking. If business itself is better the figures for the electrical energy consumption presumably devoted to the production of goods do not show it. The shipment of goods produced shows insignificant gains. Retail sales are off. Credit expansion policies so far fail to be reflected in credit expansion results.

Increased purchasing power of the farmer is one bright hope of the moment. The cotton crop price improvement in two months is credited with raising the buying power of the Southern farmer, for example, by a probable $200,000,000. Such results will be reflected later when actually realized in crop sales and marketing.

Power Becomes an Issue in Georgia Campaign

Political interest and much local publicity in Georgia is centering in Atlanta, where Congressman Charles R. Crisp is campaigning against Gov. Richard B. Russell, Jr., for the office of United States Senator. Governor Russell charged Congressman Crisp with being controlled by the "power trust," making the recently effected federal electricity tax one of the chief campaign issues.

Charles R. Crisp and his associates have brought counter-charges that the Governor is more closely identified with the power interests than he, stating that a director of the Georgia Power Company is an official member of the Governor's campaign committee, other power company attorneys over the state are active supporters of his, that his own family are stockholders in the power company and that he has done nothing to bring about a reduction in power rates in the state either as a member of the Legislature or as a state executive. It is further contended that Governor Russell, now a candidate for an office which has no jurisdiction over the subject, is trying to make an issue of it.

Coming Meetings

Great Lakes Division, N.E.L.A.—Engineering Section, Milwaukee, Wis., Sept. 6-8. Executive conference French Lick Springs, Ind., Oct. 6-7. T. C. Polk, 20 N. Wacker Drive, Chicago.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 7-9. H. A. Buch, Telegraph Bldg., Harrisburg.

Rocky Mountain Division, N.E.L.A.—Stanley Hotel, Estes Park, Colo., Sept. 12-14. G. E. Lewis, 367 Gas & Electric Bldg., Denver.

Empire State Gas and Electric Association—Saranac Inn, N. Y., Sept. 22 and 23. C. H. B. Chapin, Grand Central Terminal, New York.

Electrochemical Society — Cleveland, Ohio, Sept. 22-24. Colin G. Fink, Columbia University, New York.

National Electrical Manufacturers Association—Westchester Country Club, Rye, N. Y. Sept. 26-29. A. W. Berresford, 570 Lexington Ave., New York.

Illuminating Engineering Society—New Ocean House, Swampscott, Mass., Sept. 26-30. E. H. Hobbie, 29 W. 39th St., New York.

National Electrical Wholesalers Association—Hotel Statler, Buffalo, N. Y., Sept. 26-30. E. Donald Tolles, 165 Broadway, New York.

American Welding Society — Buffalo, N. Y., Oct. 3-7. M. M. Kelly, 29 West 39th St., New York.

National Electric Light Association—Engineering Committees meeting. Edgewater Beach Hotel, Chicago, Ill., Oct. 3-7. A. J. Marshall, 420 Lexington Ave., New York.

National Safety Council—Washington, D. C., Oct. 3-7. W. H. Cameron, 20 N. Wacker Drive, Chicago.

Association of Electragists International—Kansas City, Mo., Oct. 10-12. L. W. Davis, 420 Lexington Ave., New York.

American Institute of Electrical Engineers—Middle Eastern District Meeting, Baltimore, Md., Oct. 10-13. H. H. Henline, 33 West 39th St., New York.

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A.I.E.E. Committees Formed for 1932-33 Administration

Announcement has been made by President H. P. Charlesworth of the appointment of the chairmen of the 43 general and technical committees of the American Institute of Electrical Engineers for the administrative year 1932-33. These are, in part:

TECHNICAL COMMITTEES—Automatic Stations—D. W. Taylor, United Engineers & Constructors, Inc. Communication—H. S. Osborne, American Telephone & Telegraph Company. Electric Welding—K. L. Hansen, consulting engineer. Electrical Machinery—Stuart L. Henderson, Westinghouse. Electrochemistry and Electrometallurgy—Warren C. Kalb, National Carbon Company. Electrophysics—V. Bush, Massachusetts Institute of Technology. General Power Applications—C. W. Drake, Westinghouse. Instruments and Measurements—E. J. Rutan, New York Edison Company. Applications to Iron and Steel Production—F. O. Schnure, Bethlehem Steel Co. Production and Application of Light—W. T. Blackwell, Public Service Electric & Gas Company. Applications to Mining Work—D. E. Renshaw, Westinghouse. Power Generation—J. R. Baker, Pennsylvania Water & Power Company. Power Transmission and Distribution—P. H. Chase, Philadelphia Electric Company. Protective Devices—R. T. Henry, Buffalo, Niagara & Eastern Power Corporation. Research—Chester W. Rice, General Electric. Transportation—E. L. Moreland, Jackson & Moreland.

GENERAL COMMITTEES—Executive—H. P. Charlesworth. Board of Examiners—H. Goodwin, Jr., consulting engineer, Philadelphia, Pa. Code of Principles of Professional Conduct—R. F. Schuchardt, Commonwealth Edison Company. Constitution and By-Laws—W. S. Gorsuch, Interborough Rapid Transit Company. Coordination of Institute Activities—E. B. Meyer, United Engineers & Constructors, Inc. Economic Status of the Engineer—C. O. Bickelhaupt, American Telephone & Telegraph Company. Edison Medal—D. C. Jackson, Massachusetts Institute of Technology. Lamme Medal—C. E. Skinner, Westinghouse. Legislation Affecting the Engineering Profession—H. A. Kidder, Interborough Rapid Transit Company. Membership—R. L. Kirk, Duquesne Light Company. Award of Institute Prizes—W. H. Harrison, American Telephone & Telegraph Company. Public Policy—B. Gherardi, American Telephone & Telegraph Company. Safety Codes—F. V. Magalhaes, Hall Electric Heating Company. Standards—A. M. MacCutcheon, Reliance Electric & Engineering Company.

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Alabama Commission Wants More Regulatory Power

Amendments to the public utilities laws which would give the Alabama Public Service Commission greater regulatory power are to be sought in the present extra session of the Alabama Legislature (ELECTRICAL WORLD, August 13, page 196). The commission, in a lengthy report to the legislative investigating committee, points out provisions which it asks be enacted into law, as follows:

Extend and strengthen the commission's authority so as to enable it to require electric utilities doing business in this state to buy current from one another, sell or exchange to each other, whenever in any case the commission shall find this to be the most efficient and economical means of supply, will furnish the best service, and otherwise be in the public interest. The commission states that it has authority to compel a utility to furnish service to any applicant upon reasonable terms, but doubted its authority to compel the sale and purchase of current by one company to another company.

Amendment of those sections of the law applying to the issuance of securities, so as to put reasonable limitation upon the issuance of notes by utilities which are now excepted from regulation by the commission, when such notes are payable at a period of not more than two years from the date thereof, is also suggested by the commission. Such limitation would cover the permissible amount of any such note. The commission points out that under existing law a utility may issue a two-year note for a sum as large as its total investment, if the officers and directors see fit to undertake such financing.

Amendment of the code sections prescribing penalties for issuance of securities by utilities in violation of law and the commission's orders to include officers, agents and employees of such utilities and making them liable to penalties for such violations. Substantial increase in fees payable to the state by the utilities for supervision and inspection.

The commission suggests an amendment "to provide that no dividend may be declared upon the common stock of any operating utility corporation doing business in this state until reasonable proof has been made to the commission that reasonable reserves have first been provided for out of the utility's earnings."

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Court Again Orders Sale of Maryland Utility

In a decree handed down by Judge William G. Coleman in the United States District Court sale of the Annapolis & Chesapeake Bay Power Company, Baltimore, has again been authorized. The company was offered for sale last July, but no bidders agreed to meet the minimum price of $3,750,000 fixed arbitrarily by the court. This second order of sale fixes no minimum price, but stipulates that the purchaser must assume liability for $1,428,600 of first mortgage bonds of the company and must purchase for cash at the time of sale, at par plus accrued interest, $560,000 series B and C bonds. The purchaser must also assume a debt of $37,500 to the Mayor and City Council of Laurel, making the total liabilities of the purchaser $2,026,100. The sale will be held at Annapolis at a date to be announced later.

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South Carolina Board Broadens Rate Orders

As the next step in a program to secure lower rates for South Carolina users of electrical energy the state Railroad Commission has ordered the Carolina Power & Light Company of North Carolina, which serves eleven counties in South Carolina, to show cause in 21 days why its rate schedules for domestic, commercial and small power consumers should not be reduced on an average of 26.16 per cent in South Carolina. It is estimated that the reduction would save consumers $224,864.97 annually. In addition to the order for a reduction in rates it is suggested that the company adopt three schedules to supersede the 26 now being used.

The rate division has already ordered the Broad River Power Company (ELECTRICAL WORLD, August 6, page 164) to show cause why its rates should

not be reduced on an average of 20 per cent, estimated to save its customers $173,446.37. The commission's electric utilities division has also begun examination of the books and records of the Duke Power Company and Southern Public Utilities and the next reports will deal with those corporations.

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New Defaults in Bond Issues in August

The following electric light and power issues have been added to the list of bonds in default as of August 15:

Issue	Amount	Defaulted
Central West Pub. Serv. 3-yr., 7s	*$1,000,000	Aug., 1932
Electric Public Service, 6s	2,593,000	Aug., 1932
Insull Utility Invest. deb. A 5s	2,469,000	Aug., 1932
National Public Serv. deb., 5s	20,000,000	Aug., 1932
Western Pwr., Lt. & Tel. A, 6s	5,000,000	Aug., 1932
Total	$31,062,000	

*In default of principal and interest.

Of this total $22,469,000 represents Insull issues.

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Customers' Dividend Up in Hartford

The Hartford Electric Light Company has declared a customers' dividend of 40 per cent, amounting to more than $200,000, which will be paid to the 68,000 consumers in the form of a 40 per cent discount on bills due in October. This dividend compares with that of 10 per cent declared a year ago.

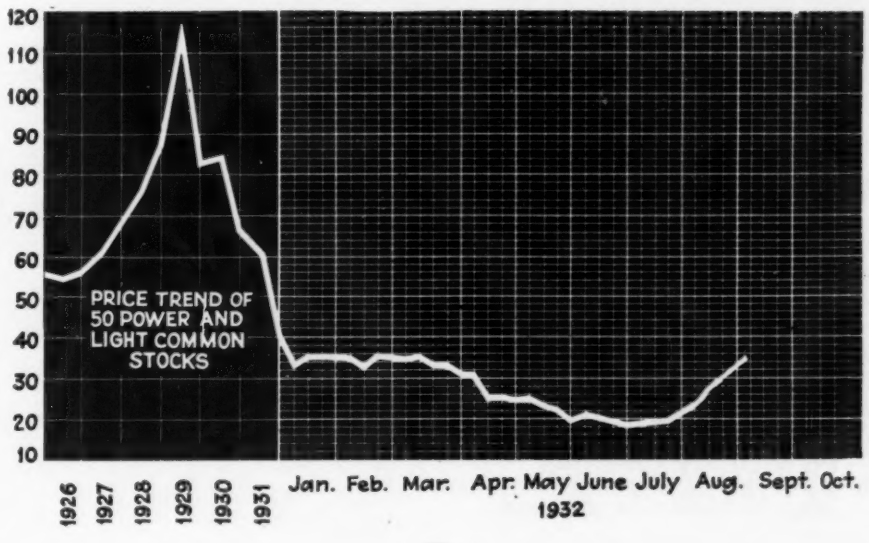
Customer dividends have been a policy of this company for several years. Samuel Ferguson, president, issued the following statement:

"The earnings of the company this year are not in excess of the amount necessary to provide the usual moderate surplus above dividend requirements and are actually 2½ per cent less than a year ago. Therefore, from a standpoint of annual earnings no customer dividend is warranted this year. However, it is well known that the income of our customers is materially reduced and that, therefore, if the dividend could be voted it would mean more to them than in normal years.

"The directors have considered the problem carefully and believe because of the strong financial condition of the company, resulting from many years of conservative operation, that no damage will result if in this year of abnormal conditions the usual amount of surplus is not retained. They have therefore voted to apply the total surplus earnings accumulated this year to date to the large customers' dividend in the certain knowledge that, with returning normal conditions, the surplus dispensed with this year can be made up in subsequent years, and that our customers will cooperate to bring this about through their continued patronage in recognition of the special action of the company at this time."

Bonds Up in August; Stocks Active

Utility bonds advanced sharply during August, the "Electrical World" index figure swinging up to 93.8, a new high for the year. Stocks continued active, advances being sufficient to carry the index up more than 3 points.



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Abitibi Committee Meets

The bondholders' protective committee of the Abitibi Power & Paper Company met in Toronto, Ont., last week to formulate a policy following default of interest on bonds. As announced in the August 6 issue of the ELECTRICAL WORLD (page 161), the 60 days grace had elapsed since the failure to pay interest on June 1, and accordingly the bonds went into default automatically on August 1.

North American Pays All Bank Loans

The North American Company has been able to pay off all its bank loans, amounting to $9,013,375, since June 30, according to the quarterly statement issued by Frank L. Dame, chairman, and Edwin Gruhl, president. The elimination of these loans followed the receipt by the North American Company of a portion of the amount due to it from the Union Electric Light & Power Company for advances to that company for construction purposes. Neither the North American Company nor any subsidiary now has any bank loans.

Union Electric Light & Power Company deposited with the North Ameri-

can Company the amount required for payment of the principal and interest of its outstanding $6,200,000 5 per cent first mortgage bonds due September 1, 1932. There are no other 1932 bond maturities in the North American system.

▼

July Utility Revenues Fail to Show Increase

Central-station revenue continues to move parallel with that of last year. Preliminary analysis of returns for July thus far received shows an average decrease of 7.8 per cent from 1931, almost identical with the completed percentages for May and June announced elsewhere in this issue. On the basis of $167,190,000 a year ago the new July figure will be about $154,000,000 for the industry as a whole. The slight reduction from the $155,490,000 of June is normal.

Companies in the Middle Atlantic states approached last year's figures a little more closely than in June, the July average being down 6 per cent; New England receded slightly. The Middle West, with some important companies missing, is off 12 per cent and the average for the Pacific coast is down 10 per cent, somewhat more than in June. Other sections show no significant changes from the preceding month.

The effect of such improvement in industrial conditions as may have occurred in recent weeks cannot be manifested in the revenue reports for some time to come. Energy sales during August do not in general appear as revenue until September and the information cannot be assembled, even in a preliminary way, until late October.

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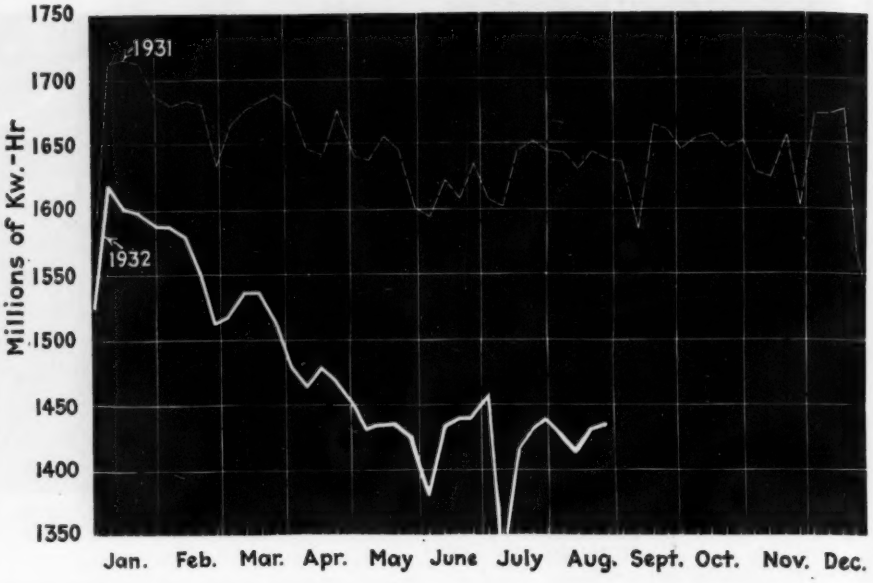
New Utility Offerings $62,427,000 in August

New security offerings by the electric light and power companies of the country amounted to $62,427,000 in August, against $77,500,000 in July and $27,975,000 in August, 1931. August brought the eight-month period to a close with a total of $297,557,800, as compared with $1,104,920,000 for the similar period of 1931.

The two Insull issues—Commonwealth Edison and Public Service Company of Northern Illinois—accounted for more than half of the August total, totaling $18,000,000 and $20,000,000 respectively. Proceeds from almost all the new issues are to be used to meet the refunding needs of the companies. The fact that the utility companies have been able successfully to raise this money at a time when the selling of long-term issues of whatever character is difficult shows how well the better utility issues have retained their market status.

Name of Company	Amount of Issue (Par Value)	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Commonwealth Edison Co.	$18,000,000	30	First mortgage gold bonds, series G,	To reimburse company for capital expenditures, to retire bank loans and for other corporate purposes	5¼	93	6
Southern Indiana Gas & Electric Co.	5,500,000	25	First mortgage gold bonds.	To liquidate floating debt and to retire funded debt.	5½	93½	6
Iowa Electric Light & Power Co.	6,000,000	10	First mortgage gold bonds, series C	To meet maturing obligations.	7	100	7
Public Service Co. of Northern Illinois.	20,000,000	5	First lien and refunding mortgage sinking fund convertible gold bonds, series G.	To reimburse company for capital expenditures, to retire bank loans and for other corporate purposes	6¼	98	6.99
Rochester Gas & Electric Corp.	8,478,000	30	Genera / mortgage gold bonds, series E.	To pay off loans.	5	92¾	5.50
Dayton (O.) Power & Light Co.	4,449,000	9	First and refunding mortgage gold bonds.	To reduce indebtedness.	5	98½	5.21
Total.	$62,427,000						

Week's Output Rises Moderately



PRODUCTION of electrical energy in central stations during the week ended August 27 is announced by the National Electric Light Association as 1,436,440,000 kw.-hr. Besides being an increase, though a small one, compared with the preceding week the output gained a little toward closing the gap between last year's and this year's operations. Three weeks ago the disparity was 13.1 per cent; the next figure was 12.9 per cent; last week it was cut to 12.3 per cent.

In each of the regions for which comparisons are worked out the operations remain lower than last year, but in each region, also, the approach is somewhat closer than in the week before. The Central remains farthest below 1931.

Weekly Output, Millions of Kw.-Hr.

Week Ended.....	1932	1931	1930	1929
August 27.....	1,436	1,638	1,688	1,762
August 20.....	1,432	1,643	1,691	1,750
August 13.....	1,415	1,629	1,677	1,733
August 6.....	1,427	1,643	1,692	1,730
July 30.....	1,440	1,644	1,678	1,725
July 23.....	1,434	1,651	1,686	1,723

Per Cent Change from 1931

Region	Week Ended Aug. 27	Aug. 20	Aug. 13
Atlantic Seaboard.....	— 8.2	— 8.8	—10.1
New England alone....	— 8.6	— 9.1	—11.2
Central industrial.....	—15.2	—16.3	—16.6
Pacific Coast.....	—11.9	—12.4	—11.9
United States.....	—12.3	—12.9	—13.1

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Refrigeration Bureau to Carry On, Says Davidson

Rumor to the contrary, the Electric Refrigeration Bureau will continue to function in 1932 and, says Executive Chairman J. E. Davidson, "I am confident that it will continue in 1933, although I am in no position at this early date to guarantee the continuance as an accomplished fact."

Mr. Davidson traces the rumor to the 25 per cent voluntary cut accepted by

the bureau in 1932 contributions from electric refrigerator manufacturers. "Because of this curtailment," Mr. Davidson points out, "the fall program was revised. I am happy to say that although several activities—including national advertising—had to be restricted, not one of the contemplated activities has been abandoned, and all are going ahead vigorously. The money is in hand to carry through for 1932. Any discussion of 1933 plans is premature, as is the question of whether the bureau will continue in 1933. The subject has not come before the executive committee nor have I asked any of the contributing manufacturers for any commitment. Voluntarily five of the ten contributing manufacturers have informed me of their desire to continue their support. No contributing manufacturer has stated to me any desire to discontinue.

"That the bureau ought to continue seems to me to be self-evident. It has accomplished tangible results of value far beyond the modest cost. The first result of the two years of activity of the Electric Refrigeration Bureau is increased sales of refrigerators.

"Because of the bureau, national and local advertising, because of the many co-operative exhibits sponsored by local bureaus, because of the continuous round of local and seasonable sales campaigns fostered by the bureau, sales have been maintained at a high peak despite general business depression. The bureau was certainly instrumental in making the number of refrigerators sold in 1931 greater than in any previous year and in maintaining the rate for the first six months of the present year. I do not claim that the bureau was the only factor in keeping up the rate of sales. I do claim that it was a major factor, and I believe the industry generally has the same belief.

"The bureau has been of inestimable service in bettering trade relations not only among dealers but also as between dealers and the central station. The greatest evil in the industry today is the inevitable result of business depression. I refer to cut-throat competition, unwarranted trade-in allowances on old ice boxes, malicious misinformation about competitors, all the ills of dog-eat-dog selling tactics. Where local bureaus are operative, these evils are materially lessened. The bureau is the only effective means I know to remedy these ills."

Major New Construction This Week

TRANSFORMERS and accessories, motors and controls, panelboards and instruments, conveying and other electrical equipment required for glass jar plant of Alexander H. Kerr & Company at Huntington, W. Va. A $200,000 project.

Machine drives, motors and controls, regulators, conveying and other electrical equipment will be installed in new addition to tissue and crepe paper mill of National Cellulose Corporation, Baldwinsville, N. Y., to cost over $70,000.

Generator, boilers, coal- and ash-handling equipment and accessories to be installed by Cincinnati Rubber Manufacturing Companu, Cincinnati, Ohio, at cost of over $50,000.

Five 440-volt power distributing switchboards, one 4,000-volt switchboard, transformer substation equipment, control equipment, lighting panels, fixtures, wire and cable and miscellaneous electrical apparatus are asked for in bids closing September 15 for Joint Meeting Sewerage Treatment Plant at Elizabeth, N. J.

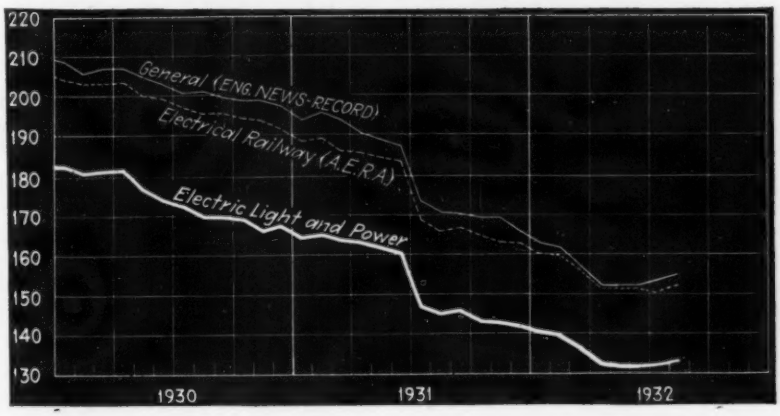
A $1,500,000 hydro-electric generating plant on Dosewallips River, near Brinnon, Wash., is planned by Washington Electric Company, Seattle, Wash., including transmission lines. Power dam will cost $670,000 of amount noted. Application for permission has been made.

Generator Order Shipped 41 Days After Receipt

Said to be a record for speedy production of such equipment, the General Electric Company has shipped two 10,000-kw. waterwheel-driven generators to the purchaser 41 days after receipt of the order. The Niagara Falls Power Company had an excess of 25-cycle generators, but required additional 60-cycle generating capacity. The suggestion was made that it remove two of the 25-cycle machines and obtain two 60-cycle generators to mount on the bedplates of the old generators, the same waterwheels being available for use.

A contract was awarded on July 7; the Buffalo office telephoned the information to Schenectady that afternoon. The machines were special, and needed to be designed as well as built. Both machines left Schenectady on August 17, six days ahead of schedule.

Construction Costs Again Rise



AFTER dropping gradually to a minimum in June electric light and power construction costs rose by about 1 per cent in July and again in August. The movement was in harmony with that of other construction indices which, during the past couple of months, have had an upward trend, as will be evident from the accompanying table and chart. The change is in distinct contrast with the decrease of 2 per cent at this time last year as well as with the progressive decline earlier in 1932.

Predictions are hazardous; most persons have become very circumspect about making them. From the present data, the reported stiffening of wholesale commodity prices and other indicators of recent business trends it does, however, seem to be a fair conclusion that the turning point has been not only reached but actually passed. Apparently the time is ripe for making extensions and improvements of which the need can be foreseen.

Construction Cost Indexes: Electric Light and Power, Electric Railway and General

Base: 1913 = 100

	Electric Light and Power*	Electric Railway*	General—*Engineering News-Record*
August, 1932...	133	153	156.8
July, 1932.....	132	150	153.4
June, 1932.....	131	150	152.2
May, 1932.....	132	151	152.8
April, 1932.....	132	151	153.1
August, 1931...	146	167	171.4
Last 5 yrs. high	184	206	210.4
Month.....	Apr. '29	Nov. '28	Feb. '29
Last 5 yrs. low	131	150	152.2
Month.....	June, '32	June, '32	June, '32

*Computed by Albert S. Richey.

New York Metal Prices

	Aug. 23, 1932 Cents per Pound	Aug. 30, 1932 Cents per Pound
Copper, electrolytic.....	5.375	5.50
Lead, Am. S. & R. price.	3.40	3.60
Antimony.....	5.25	5.50
Nickel ingot.....	35.00	35.00
Zinc, spot.....	3.10	3.15
Tin, Straits.....	23.00	24.50
Aluminum, 99 per cent..	23.30	23.30

Memphis Rate Cut Ordered

Memphis Power & Light Company has been ordered by the Tennessee Railroad & Public Utilities Commission to reduce its rates as of September 1. The reduction, for small customers, amounts to about 12 per cent. Whether or not this will be acceptable to the company is not known. Officials are said to be busy studying the effect of the order upon corporate income. An appeal is permitted within 60 days.

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Dnieprostroy Dedication

While the 756,000-hp. Soviet hydroelectric development on the Dnieper River has been completed and Col. Hugh Cooper, the American engineer responsible for the project, has been released from further responsibility and supervision, actual dedication of the plant and formal presentation of medals to Colonel Cooper will not take place until October 1. Delay in shipment of floodgates necessitated a change in plans and date of formal dedication.

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Decatur, Ind., Relief Plan

Unemployed heads of families in Decatur, Ind., who use energy from the municipal light plant will be permitted to use up to $1 worth of electrical energy per month on open account, according to a resolution adopted by the City Council. The resolution states that if the customer uses more than the minimum allowed the service shall be disconnected unless the amount standing is paid in full. An affidavit must be filed at the city hall by all who wish to benefit by the new ruling.

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Trade Hearings to Resume

On September 13 the Federal Trade Commission will resume its investigation of public utility holding companies. Associated Gas & Electric system (ELECTRICAL WORLD, August 27, page 260) will be first on the list of companies to be reported upon.

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Decision Against Power District

Efforts of public ownership advocates for formation of a power district in Spokane County outside of incorporated towns and cities (ELECTRICAL WORLD, July 23, page 104) were nullified when Judge Fred Witt of the Washington Superior Court ruled that petitions bearing the signatures of several thousand voters asking that the public power proposal be placed on the ballots in the coming election were "fatally defective." Similar legal action has been brought by property owners in Spokane. Judge Huneke will rule on this question later. Petitions for the formation of districts have been filed with the commissioners of Yakima and Skagit counties.

▼

Utilities Warned on Postage

The Post Office Department has sent notices to all postmasters urging them to warn public utility corporations against avoiding payment of 3-cent postage by illegal use of the 1-cent drop-letter rates. Numerous violations of the postal regulations are said to have led the department to point out that a 1-cent drop letter rate is only applicable to post offices where there is no city or rural delivery service.

▼

I am helping you and I expect some help in return. I am not doing this from an altruistic motive. I am not doing this for the uplift of everybody in civilization. I am doing this because it is best for me and my business to do it. Why not be frank about it?

H. P. LIVERSIDGE
Vice-President and General Manager
Philadelphia Electric Company.

[**Mr. Liversidge, from a wealth of successful experience, expresses his attitude toward "every other member of the electrical industry in my own home town" in debunking the more familiar expressions of motives for utility - wholesaler - contractor - dealer co-operation.**]

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N.E.L.A. Lighting Committee Active

That the home lighting committee of the National Electric Light Association intends to pursue aggressively the work so successfully undertaken last year is evidenced in two booklets just issued by it, one dealing with modern fixtures and the other with portable lamps. While the material of each booklet is somewhat general in character, a definite program containing supporting details suggestive of the value and necessity of developing this lucrative class of revenue is outlined.

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Los Angeles Discord

By a vote of ten to four the Los Angeles, Calif., City Council has rejected Mayor John C. Porter's proposal to remove from office three Water and Power Commissioners. A previous removal action was defeated by the Council in May of this year. The removal proposal was filed by Mayor Porter August 13 in an effort to halt what he termed a riot of wastage of public funds. In filing the order of removals the Mayor, it was believed, did not anticipate that the Council would sustain him, but filed the removals as a gesture to protect himself from responsibility for the actions of the commission. More than $1,000,000 has been wasted, the Mayor said, since the Council refused to sustain him last May.

Tax Absorption in Indiana

Governor Leslie of Indiana has signed a law passed by the recent session of the Legislature which authorizes the Common Council of any city that owns a municipal electric plant to provide by ordinance that the federal tax on electrical energy imposed by the 1932 federal revenue act may be paid out of the earnings of such plant and set aside annually a sufficient sum to pay such tax.

▼

Railroad Energy Tax-Free

In an informal ruling on railroad-used electrical energy the Department of Internal Revenue has expressed the opinion that "electrical energy furnished the company in the conduct of its business as a common carrier by railroad is exempt from the tax and includes that furnished (a) at its shops and in its yards, (b) at freight and passenger stations on its line of railroad, including union stations. The electrical energy consumed (c) in its office buildings at general headquarters and division and district headquarters and (d) in its offices in off-line territory such as (1) those for commercial agents, (2) passenger agents and (3) uptown ticket agents is not exempt from the tax."

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South Carolina Tax Action

The Broad River and Lexington Water Power companies, which had previously announced their intention to appeal to the United States Supreme Court from the decision of the three-judge federal court in the matter of the five-tenth mill tax imposed on electricity sold in South Carolina, have given notice to the South Carolina Tax Commission that they are perfecting their appeals in preparation for the further court procedure. The tax of five-tenth mill per kilowatt-hour on all electricty sold in South Carolina was imposed by an act of the Legislature in 1931. The three-judge court several months ago refused to declare the tax unconstitutional.

▼

Kentucky Utility Befriends Anglers

The Kentucky Utilities Company of Louisville, after completion of Herrington Lake, on Dix River, near Danville, Ky., stocked it with bass and other game fish and opened it to the public. So successful was the undertaking that an appeal was made to the federal government by state authorities for assistance in keeping the lake stocked. In response the federal Fisheries Bureau started a co-operative program which is expected to result in the planting of 25,000 fingerling bass annually in the lake at virtually no cost to the bureau.

Ready for the Eclipse of the Sun

IN ORDER to measure accurately the intensity of illumination during the eclipse of the sun Wednesday observers of the McGill expedition arranged this equipment for use at Magog in Quebec. Automatic recording instruments with numerous Weston photronic cells were to obtain quantitative data of the sunlight previous to the eclipse, of the north sky intensity of light and of the effects during totality. Hitherto the inability of the human eye to adjust itself to rapid daylight-to-darkness conditions has been a difficulty, now overcome with the newer form of photo-cell apparatus.

▼

Improved Magnet Steels Developed in Japan

A new series of magnet steels known as "MK" and characterized by an extremely high order of permanence is reported in an announcement in the July, 1932, issue of the *Ohm,* a Japanese technical publication, to have been developed and perfected by Dr. T. Mishima of the Tokyo Imperial University.

The announcement states that the coercive force is about nine times that of the usual tungsten magnet steels and 2½ times that of the best cobalt magnet steels. The residual magnetism (magnetic strength) can be varied so that its value is between that of tungsten and cobalt magnet steels.

The "MK" steels consist mainly of iron, nickel and aluminum. A typical composition is 25 per cent nickel, 10 per cent aluminum, balance iron, but the nickel may be varied from 10 to 40 per cent and the aluminum from 1 to 20 per cent. The "MK" steels are not readily forged and must, therefore, be cast into the desired form.

It is said that the magnetic properties of the "MK" steels do not change appreciably with increase in temperature even to the extent of several hundred degrees Centigrade. They are also said to be stable, magnetically, when subjected to mechanical vibration or shocks.

▼

New Welding Process May Broaden Use

A new welding process said to simplify greatly continuous automatic welding procedure was revealed in Cleveland last week coincident with an announcement by Pierre Champion, vice-president of the Champion Rivet Company, that his organization would enter the welding field.

By means of a simple arrangement which holds the rod of welding metal against the joint the welding is effected with a constant voltage along a joint which may be of any length up to 50 ft.

The device which makes the process possible is so simple, according to Mr. Champion, that it is planned to give it away with each initial order of welding rods. Officials of the company believe the new technique may replace the more expensive machinery which feeds the welding rod from coils, guided by an operator so that the metal is applied to the right place. The new device may put automatic welding into every shop.

The method is reported to eliminate all electrical control devices. A paste-coated welding rod is laid down in a V-shaped depression between two plates and the current applied through a series of electrical contacts made by arms reaching down from a busbar. Applications of the new device are prepared for the manufacture of steel tubing, frames for large machinery, oil storage tanks and other industrial material. As yet the process has not been developed for use in steel building construction.

▼

Constant-Current Generator Improves Dredge Action

By providing the new electrically equipped governmet dredge *Dundee* with constant-current rather than constant-voltage power Westinghouse engineers greatly improved the ability of the suction equipment to clear obstructions in the pipe line. The main 800-kw. geared turbo-generator inherently delivers practically constant current to the 1,000-hp. pump motor over a voltage range of 250 to 312 volts. When an obstruction tries to form in the pipe line decreased discharge volume and the automatic rise of voltage make the pump work harder, exerting a tremendous force toward clearing the discharge pipe. As soon as conditions are normal the generator resumes operation at 250 volts. No overload protection is required in the main pump motor circuits, since the generator characteristics automatically limit the current to full load value. Should the load be dropped suddenly when the voltage reaches 375 an overvoltage relay automatically inserts resistance in the generator field circuits to prevent excessive voltage build-up.

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Predetermined Changes for Fountain Lights

Spectators of the changing lights—red, green, white and yellow—which flood Chicago's Buckingham Fountain at night see an hour's program controlled by thermionic tubes and a tape-like record. There are 23 circuits and for each of them a long ribbon of fireproof film, on which the predetermined program is laid out in copper braid. The film moves slowly over a roller wound spirally with resistance wire, and the varying position of copper braid controls the voltage on the control circuit. This slight variation controls successively three vacuum tubes, which actuate a three-legged reactor, which in turn varies the voltage on the lights. As no resistance is used in the lamp circuit, the energy saving is large. To lay out a new program the braid need only be sewed on the film in a different path, by an attachment used on a sewing machine. A Westinghouse development.

EDITORIALS

L.W.W.MORROW
Editor

Depression-born economies

WHILE a period of declining peak loads, output and revenues, with its concomitant halt in plant expansion such as the electric utility industry has gone through, would not appear to be the most feasible time for carrying out the development of major changes in the fields of generation, transmission or distribution of power, this should be a period for the birth and the development of ideas along these lines. Now ought to be the ideal time to bring through the germinating stage and to a good-sized growth, ready for transplanting, the new ideas that will contribute toward lower capital cost per kilowatt and lower operating cost per kilowatt-hour in the system expansion that will most surely take place once we pull out of our present economic mire. In the half decade of intensive expansion preceding the present period of inactivity, when the question of catching up with loads was paramount, when it did not appear possible, let alone probable, that operating economies to compensate for declining load would have to be resorted to—in those days many of these problems were not, and most frequently could not be, considered. The effects of such neglect were evidently overlooked and passed unobserved just so long as system loads were expanding.

The situation is different today. The electric utilities, with all their intensive sales efforts, have been able only to delay—not to forestall—the decline in their outputs and revenues. Obviously, to enable them to achieve more, a miracle would have been required. Under these conditions the companies least affected are those whose capital investment is lowest per kilowatt of system load and whose physical facilities are so laid out and constructed as to make possible operating economies in some proportion to the declining output. In both of these directions lies salvation for all, and they constitute one of the safest yardsticks by which to measure the utility structure.

If these contentions are sound, why is not the present the very time for carrying out such development? Funds may be none too plentiful nor reasonably easy to replenish, but if the expenditure of one dollar will cut operating or maintenance expense fifty cents a year, is not this the very procedure for working out present problems? Opportunities like these exist in almost all branches of the industry. Here are a few: Incremental loading of steam plants, high-speed switching, high-speed relaying, better lightning protection on distribution systems, more intensive study of performance of built-up dielectric structures to reduce failures and the development of diversion-proof metering methods.

In fact, if in the entire field of generation, transmission and distribution sufficient intensive work is done, it will be found that relatively small expenditures at the present time can be made to yield very high returns.

Tasks for the engineer are plentiful

ENGINEERS have been hard hit when budgets were pared to meet reduced operating revenues. Of course there can be little excuse for active engineering construction when existing facilities are no longer taxed by the load. But J. C. Parker at Atlantic City this summer said the engineer's manner of approach was sorely needed in several other departments of the utility business. A. E. Silver likewise pointed out that there

is plenty for the engineer to do now right within his own sphere.

When going is good the least profitable moves are deferred. But when margins get smaller the less conspicuous items of a former day loom larger in significance. New conditions establish new relative values. Many a competent engineer must have seen in their papers definite clues to specific instances where his talents would render an unimagined service. If he is at the moment without assignment, let him brief his proposals and sell them convincingly to management. The unusually complete picture portrayed by Mr. Silver, in one of ELECTRICAL WORLD's recent issues, shows there is no dearth of profitable opportunities to be disclosed by eager engineering.

Longer hours for machines

SHORTER hours for people and longer hours for machines featured a valuable paper by Harold M. Davis recently at a re-employment conference in Boston attended by five New England governors and nearly 100 leading industrialists, economists, social workers and educators who devoted an entire day to studying the possibilities of the flexible work day and week as a means of returning some 3,000,000 persons to business and industry. The merits of this so-called New Hampshire Plan engaged the gathering sufficiently to lead to a resolution to President Hoover for his consideration of the usefulness of a national conference on the application of the principle of attaining job security through job sharing. Similar conferences were recommended for the consideration of individual states.

The proposed lengthening of machine service is of much interest to the power industry, which is in an admirable position to co-operate in the supply of electricity to meet widely varying demands and changes in industrial production conditions as related to time periods. Opinions differ as to the effect of the plan on the purchasing power of the workers whose wages are to be percentaged to pay the re-employed people who share their jobs, but it is anticipated that the application of the plan would lead to increased consumption of commodities, heightened morale and probably in time to a fair measure of prosperity. Each industry and business would have to work out the periods of production, labor distribution, etc., on its own basis. From the load-building standpoint the possibilities of serving more flexible applications of power are most promising.

Let's have some intelligent selfishness

LOOKING at business in a cold, matter-of-fact light, "why should utility companies care whether weak, non-commercially minded dealers and contractors continue in business, dry up or prosper? Why should large manufacturers be expected to develop product distribution with trade co-operation if they can easily institute a large-scale distribution organization of their own? How can weak dealers expect stronger ones or the rest of the trade to protect and coddle them when the others have nothing to gain thereby? How can electragists expect other branches to give support to their plans if those interests can secure business more easily by other methods?

Co-operation as an appeal or plan means nothing in itself. The important factors are the motive behind the plan and the spirit back of its execution. Few co-operative plans have ever succeeded unless they considered customer viewpoint, unless each party benefited, directly or indirectly, in proportion to the individual effort contributed and unless each party's achievements were at least equal to those obtainable by tackling the job competitively.

Too many co-operative efforts have been attempted under the guise of altruism or uplift. In this practical bread-and-butter world few have faith in altruism. They suspect an "ax to grind" or a "nigger in the woodpile."

Teamwork, not destructive competition, is needed. But all parties affected by the plan must benefit. As long as self-interest is a strong motivating influence, let's have some intelligent selfishness and not try to disguise it as altruism.

We recommend H. P. Liversidge's philosophy on page 300, particularly his suggested declaration:

"I am helping you and I expect some help in return. I am not doing this from an altruistic motive; I am not doing this for the uplift of everybody in civilization. I am doing this because it is best for me and my business to do it."

Why not be frank about it?

Interdependence Within the Industry

By H. P. LIVERSIDGE*

Vice-President and General Manager
Philadelphia Electric Company

Friendly relations between industry branches should and can exist.

Appreciation of all points of view necessary.

A common objective.

I WONDER whether we are ready, as an industry, for better times—for the bigger things ahead? As individuals, our answer will surely be "Yes." As companies, our answer will be the same. "We have put our house in order, we understand the problems in our business better today than ever before, we understand our markets better today. Yes, we are ready."

But are we? Are we ready as an industry? I sometimes doubt very much whether collectively we understand what is really meant by the electrical industry. Some of us don't act as if we did, and I will include myself in the criticism.

At times I find myself thinking of one branch as the entire industry, thinking of my particular company and its business—the manufacture and sale of electrical energy—in too inclusive a sense. Then I have to bring myself up rather sharply and say: "Hold on a minute. You are only one part of this electrical industry. You are not the whole show by any means."

If I know what I'm talking about there are four major branches of this industry. They are represented by, or perhaps it would be better to say they are embodied in, the National Electrical Wholesalers' Association, the National Electrical Manufacturers' Association, the Association of Electragists, International, and the National Electric Light Association. There are others, of course, but I do know these four contain the major groups composing the electrical industry. Now, if that is a fact; if there are at least four chief divisions of this industry; if we are all interdependent; if each is incomplete without the others—then

how can I, as an individual engaged in just one phase of this four-sided enterprise, hope to achieve maximum success by ignoring or underestimating the importance of the three other interests and going it alone?

The proposition is too simple, too clear and, in such times as seen now, too halting and shortsighted for the answer to be other than a simple negative. We can't go about our business in that way, and I don't believe any one interest or subdivision of an interest represented here has any desire to take everything to itself and leave other interests which have contributed to the success of the entire industry to go their ways unnoticed—as if this industry were not of necessity an indissoluble partnership.

I know we don't as individuals think and act along these lines, yet when it comes to our national organizations we too often seem to be going at tangents, to be trampling on each other's toes, so to speak, and I raise the question, "Why?" If we as individuals are willing to play ball; if as individuals we are willing to accord a square deal to others in the industry, then why, collectively, can't we do the same thing? I have thought over this a great deal. In my opinion, the reason can be expressed in one simple word, "misunderstanding." I honestly believe that's the answer.

I know full well that in my home town we are living together happily. I know that the electrical contractors in that town expect fair dealing and friendly help from the electric utility. I know that the electric utility likewise expects of the electrical contractors every helpful consideration. I think we are both getting it. I know that the manufacturers' representatives, the wholesalers and the dealers in my home town expect fair dealing of each other, friendly help when they call for it. We meet each other in our daily contacts. We can sit down around the same table and play the same game of golf. We learn at least to understand each other's problems. When we can think in terms of the other man's troubles and the other man's problems we are in a very much better position, as I view it, to work with him, because we are interdependent, and do it in a frank manner. I haven't the slightest objection to saying to every other member of the electrical industry in my own home town,

"I am helping you and I expect some help in return. I am not doing this from an altruistic motive; I am not doing this for the uplift of everybody in civilization. I am doing this because it is best for me and my business to do it." Why not be frank about it?

We must have the same general objective, the same thought and the same performance so far as our national organizations are concerned. I feel certain we are moving slowly and steadily toward that end—a closer understanding of each other's aims and objectives. In the last analysis, we serve one common customer, the public, and we should have the same objective—an increasing volume of business with reasonable profits for all in the development of that business. Yet, sometimes it seems as if we forget these facts. We forget that our common customer is the great American public, and that it is public's opinion of us, as a group—not their opinion of the manufacturers, nor the utilities, nor the dealers, but their

**Abstract of address at Camp Co-operation XII, New York.*

opinion of the electrical industry as a whole—that determines how much of the dollar they have to spend will be spent in the electrical industry and not in a competitive industry. I ask you again, "Are we ready for the better times ahead?" Let me say to you that the measure of our preparedness will be determined by a comparison of our state of preparedness with that of the other business groups which are now set to secure a major share of that same consumer's dollar. Fighting over things, trampling on each other's toes and going our lone way certainly doesn't help matters in the least.

Mutual understanding essential

I wonder whether in our desire to build some grand structure, to develop our own particular end of the business, we get in a position where things aren't going just right, where we don't sit down and talk matters over in a constructive way, where we don't try to let the other man see what some of our difficulties are, and at the same time show that spirit of co-operation in which he will understand our troubles and we will understand his troubles, and after talking it over will end on a compromise platform.

That is where we will usually end anyway. Life is a compromise in any event, but at least we shall be able to make some progress. It may be a little slower, but when it is finished it will be sound and solid and each one will get his just reward, based on the effort he has put into that particular job. So, as I see it, this whole problem of interdependence, this whole problem of co-operation, really comes down to a question of understanding each other—being fair, having that spirit of helpfulness which has behind it no altruistic motive, but does have behind it that common-sense business axiom that in helping the other man you are helping yourself. There is nothing especially complicated to be grasped in understanding such a problem.

I think I can say without fear of contradiction that this situation does exist in the Philadelphia district. We understand each other, we are working together, having a fine time, and are doing a greater volume of business today than most sections of this country. You'd have a hard job getting me into a fight with any part of the industry in my home town. I have to live with the wiring contractors; I have to live with the dealers; I have to live with the manufacturers' representatives and, what's more, they have to live with me; so why not all try to go along peaceably? I know I'm going to have a better time by so doing. I won't worry so much, and neither will they. I have to live with these groups and they have to live with me. In order for life to be reasonably successful for each one of us, conditions must be mutually satisfactory.

I look forward to the time when the same spirit, the same ideals and the same personal feeling shall exist in the relations with our national associations. I believe it is possible. We have the whole United States in which to move about and in which to fight, if we want. We probably won't be as much discomfited as if we were in a single community, but the damage we will do to our sales as an industry will be very, very far-reaching.

No branch should be throttled

So I say to you again, what we need is more understanding of each other's problems. It is all very well to say, for instance, we should have cheaper appliances. As a utility operator, I'd like to see the manufacturers *give* the public appliances. That would be fine for our business, but I rather think the manufacturers have something to say about that. Most of their figures have been in the red for the past two years, so what benefit, in the long run, would there be to one branch of the industry to pound away on a program of lower-cost electrical merchandise to the point where no one can make a cent of profit?

Lower electrical rates? Certainly—nearly everybody will subscribe to that. Get them lower, if you can, but what sense can there be in forcing a utility to lower rates to a point where it will be losing money? Then everybody will be in trouble.

We ought to have cheaper wiring. Of course, it will help some parts of the industry, at least. But you are not going to lower the price of wiring to the point where the contractor can't make ends meet. He isn't in the business for pleasure any more than the rest of us. I have heard all these things argued and propounded from every angle and so have you. The difficulty has been, I believe frankly, that one group does not clearly understand the problems of the other groups. They seem to see the matter only from the standpoint of its effect on their own business, with the result that each group is likely to make demands for terms or conditions without considering how detrimental they may be to some other group of the electrical industry. We need better understanding and better co-operation in the entire industry. As each of you goes back to your individual territory, go as a diplomat carrying that spirit, that ideal of understanding and of co-ordination of your activities in your particular territory which will make for better business for all, and above all else see to it that each group in your territory works and develops its business on sound, ethical business standards.

Cut the red tape

So far as you are able, help to remove those things which are in the nature of red tape. Direct thinking, direct action, is what we need today. Furthermore, it seems to me that the electrical industry has become so entangled in ordinances, standards, complex specifications, rules and regulations that at times one wonders how we move at all. I plead for simplification of those things which have to do with the development of our business. I believe it is coming, because there is more sound, common sense in the electrical industry today, less ego among individuals as well as organizations, and more willingness to listen to helpful advice.

I see before us great opportunities, but each must do his part. When we can have our national trade organizations in the electrical industry pulling together as a single team, when all local leagues—your own electric league, if you please—represent harmonious combinations of all interests, when the individual acquires an industry consciousness, then and only then will we have aligned ourselves to do the greater job ahead.

Local leagues have the power, ability and facility to accomplish the desired results, and when our local situations are satisfactory the national problems must automatically come into line.

Let's start with the idea of teamwork, and all will be surprised with the results that may be obtained.

Power Required for Main-Roll Drives

A method of determining motor capacity for main-roll drives which has been applied to the majority of rolls in existence (about 2,000 motors totaling 2,600,000 hp.) was explained in detail before the Association of Iron and Steel Electrical Engineers recently by H. A. Winne, General Electric Company. It is based fundamentally on a rational comparison of the work to be done with the work done and power required by existing mills of the same general character. He considered the reduction per pass, delivery speed, power for reversing, motor losses, etc., and applied the principle to a specific example.

The paper was highly commended by several speakers who declared it amplifies the information available and simplifies the problem. Several speakers pointed out that steel mills cannot expect accurate selection and application of motors unless more studies like this are made by steel mill operators and the data made public so future applications can be based on experience. W. S. Hall, Illinois Steel; J. Farrington, Wheeling Steel Corporation; Fred Waldorf and A. J. Standing, Bethlehem Steel Company, particularly emphasized this need.

Amplifying or supplementing Mr. Winne's remark, A. F. Kenyon, Westinghouse Electric & Manufacturing Company, presented data to show the effect of temperature and steel characteristics on power consumption. For example, the temperature drops faster on a semi-continuous mill than on a continuous mill, even starting with the same billet, and the power consumption is considerably increased. The temperature of strip reduces faster than that of heavier products, with a consequent increase in power consumption. The chemical and metallurgical characteristics of the product rolled also have an influence, some alloys requiring 50 per cent more power because of physical properties and the fact that they cannot be heated to so high a temperature initially.

Owing to the effect of temperature, W. E. Miller, Bethlehem Steel, declared it may be necessary eventually to interlock the furnaces and rolling mills so billets will not be delivered and allowed to cool before they can be processed. Since mill operators are paid for tonnage, they frequently continue rolling when the temperature drops too low, and there are increases in slivers and seams, and more power than necessary is used. Excessive drafts (reductions) are made in some stands.

Even though motors are properly applied for the operating conditions considered, Mr. Farrington pointed out that schedules or specifications for rolling may be changed, placing greater duty on some motors. He referred to a case where changes in specifications increased the duty on edger motors 50 per cent and made it necessary to roll at lower temperatures than anticipated in the finishing stands, thereby requiring more power. Therefore, he suggested that in making calculations 10 per cent more reduction and 20 per cent lower temperature be assumed than the schedule indicates.

By combining a load limitator and signal light he has been able to warn mill operators when they are taking excessive drafts, rolling too cold, or otherwise approaching allowable power demands. From graphic power charts he reports it is possible to judge the temperature at which rolling is being done.

Roller bearing manufacturers also need power data so they can convert it to roll-neck pressures in calculating bearing requirements, otherwise only guesses can be made, and failure of a bearing interrupts production and creates a loss of return on mill investment and labor expense. Mr. Waldorf declared that a fairly definite relationship exists between roll-neck pressures and horsepower requirements and can be expressed by the formula

$$\text{Hp.} = \text{Roll-neck pressure} \times \text{Time} \times \text{Constant}$$

Experience measuring sticks are needed, says A. J. Standing, to solve applications of motors to new mills, fitting old equipment into some existing process and replacing steam-driven mills so the prompt action demanded by executives can be met by more than guesswork.

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Area Charge Essentially a Lighting Demand Charge

One of the early users of the area charge and one which has employed it most effectively in promoting increased domestic use of energy has been the Hartford Electric Light Company. There is still much doubt in many quarters about the soundness of this form of rate in spite of the success and satisfaction attending its use in tried areas. Therefore the following arguments in its favor, as gleaned from recent addresses by Samuel Ferguson, president of the Hartford company, and from literature distributed to customers offer constructive ideas to supplement the manifest economic justification of the area charge for residential service:

1. Owing to the fact that nature decrees that domestic customers shall generally use light between the hours of dusk and bedtime, there is obviously less diversity in the use of electricity for light than for other household purposes; hence both the cost and the price are naturally higher for the short-hour peak usage which domestic lighting as a whole requires than for household power requirements.

2. Separate light and power circuits with different prices involve the customer in greater expense for wiring and the company in greater expense for metering than if a single meter and schedule can be made to take cognizance of the differential of (1).

3. For a normal degree of illumination the lighting demand and lighting kilowatt-hours are a function of the floor area to be lighted.

4. For other uses floor area has no relation to demand.

5. In an area schedule the energy price is fixed to be an equitable price for the prospective *power* usage.

6. Since light is more expensive and since (except in abnormal cases) more is used in lighting a large than a small area, it would be obviously an injustice to so fashion the rate that the occupant of a large house would receive a materially greater portion of its light at the power rate than does one in a small house and, therefore, more kilowatt-hours should bear the lighting price in a large than a small house.

7. This is accomplished by graduating the fixed charge

in proportion to the area as well as by graduating the size of the first block of energy if also desirable.

8. The area charge plus the energy charge for such kilowatt-hours as are normally required for lighting purposes together amount to a sum of money representing a reasonable charge for light. The balance of the bill is power and at a power price.

9. The area charge, therefore, represents a *lighting* demand charge only and has no relation whatever to the total demand of the customer for other purposes.

10. We have thus a power price extended to every outlet in the house without any wiring cost to the customer (saving in Hartford estimated at $3,000,000) and at the same time a reasonable price paid for normal lighting service and a lower price paid for power uses or for any abnormal long-hour use of light.

11. Neither a fixed service charge, a straight meter rate nor a block meter rate will accomplish this objective.

The same arguments have, of course, equal force with respect to a room basis, although there is obviously more room for argument with the customer as to what constitutes a room than as to the actual dimensions of his home.

The contrary and uninformed view on these elements of promotional rates is typified by the remark of Albert Levitt in the April 28, 1932, issue of *Public Utilities Fortnightly,* where in an article, "Who Should Pay the Cost of Rural Extensions?" he says: "There is no relation whatever between the lay-down cost of the energy at the meter of the patron and the area of the house in which the meter is situated."

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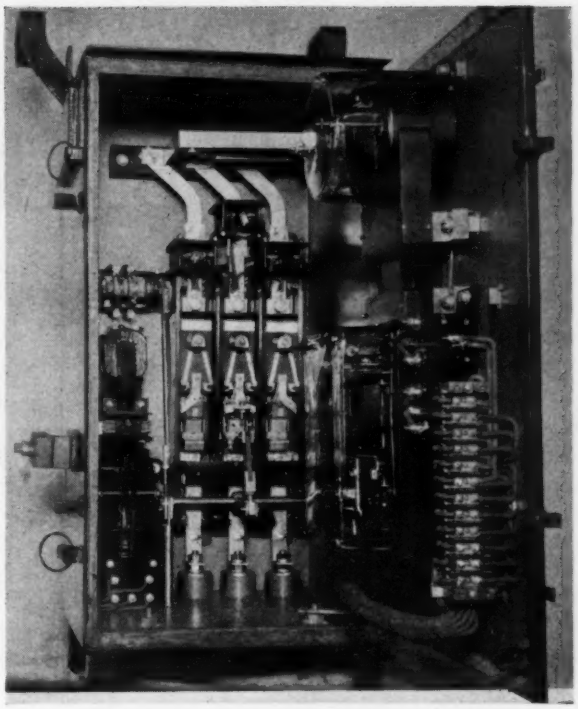
Smaller Protectors for Overhead Networks

Availability of overhead networks has hinged on the development of small and light-weight protector assembly. These pictures supplement the story about the overhead network which appeared in the April 30 issue of ELECTRICAL WORLD, pages 808-813.

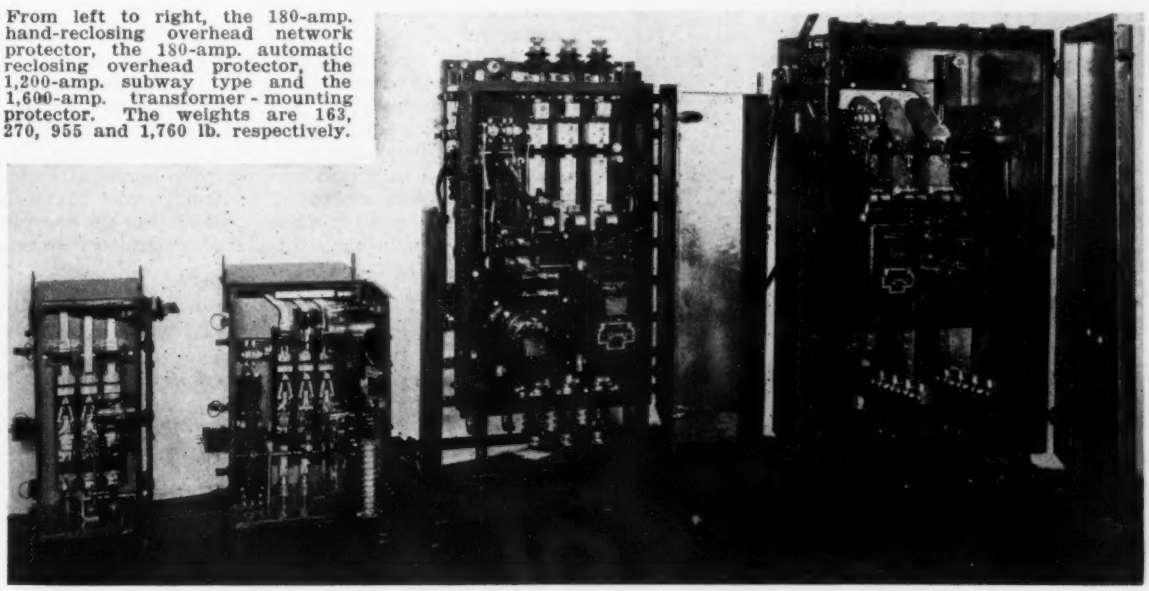


Automatic reclosing overhead secondary network protector

The low-voltage overhead network protectors retain the operating advantages of the underground protectors now in use in approximately 70 of the larger cities. Utilization of the small Delon circuit breaker recently announced for industrial application has permitted the development of a line of small, light-weight protectors suitable for pole mounting.

The automatic-reclosing protector is operated by means of a solenoid mechanism controlled by the network master relay and phasing relay common to the underground apparatus. The protectors open upon the reversal of power flow caused by a primary fault or by magnetizing current to the transformers from the network, and reclose automatically after the restoration on the primary circuit of voltage proper to insure the flow of power into the network. A hand-reclosing protector has also been developed for installation in areas where the light load density and lenient service requirements dictate the use of the least expensive equipment. It closely resembles the automatic protector in appearance, but is tripped through a coil operating directly upon the breaker by a non-sensitive directional overcurrent relay set to avoid unnecessary operation by circulating currents.

From left to right, the 180-amp. hand-reclosing overhead network protector, the 180-amp. automatic reclosing overhead protector, the 1,200-amp. subway type and the 1,600-amp. transformer-mounting protector. The weights are 163, 270, 955 and 1,760 lb. respectively.



Primary Network Stations—Vault, Building, Outdoors

By R. J. SALSBURY* and H. S. MOORE†

A SAVING of 20 per cent was made by the application of the primary network in the Boroughs of Verona and Oakmont by the Duquesne Light Company‡. The area served by the primary network is approximately 4.7 square miles and has a normal residential and light commercial load of 2,000 kva.

The territory adjacent to this area has a heavy industrial load, primarily steel mills and mines, and four 22,000-volt transmission lines supply loop service to the larger customers and are also tapped as a source of supply to the primary network transformer units, these transmission lines terminating at a switching center in Verona. The 4-kv. tie mains between transformer units are three-phase, four-wire, No. 1/0 lines and terminate at disconnecting potheads on terminal poles adjacent to the transformer units.

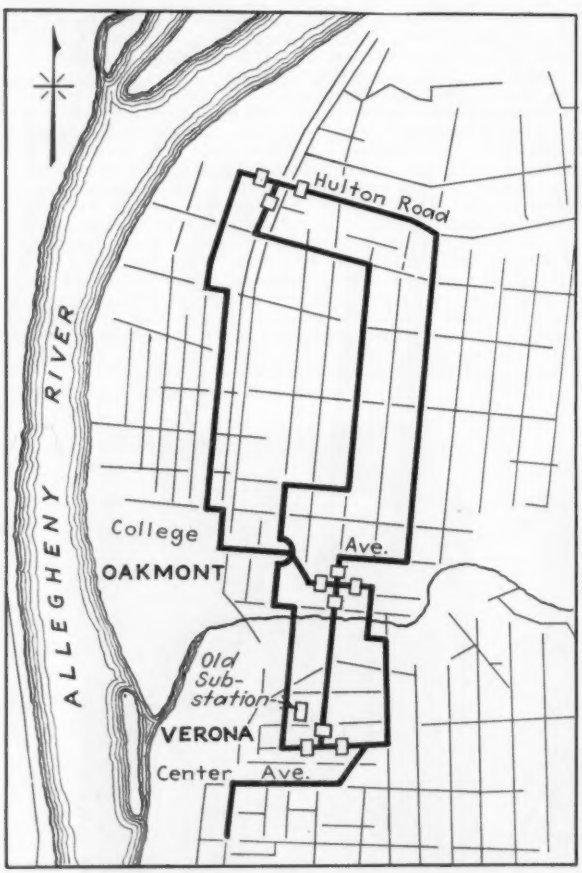


Fig. 1—Network serves 4.7 square miles

Two ties between each pair of stations, all three fed from 22-kv. lines and buses at and between Verona and Pine Creek substations.

The primary network utilizes standard equipment and, due to the use of higher-impedance, low-capacity transformers, the duty on the oil circuit breakers is reduced, thus simplifying the equipment and its arrangement. Each primary network transformer unit consists essentially of a high-voltage disconnecting switch, a three-phase transformer, a means of voltage regulation when required, a transformer oil circuit breaker and tie main oil circuit breakers, with their controls and connecting cables. The equipment adopted consists of the following:

1. A 1,500-kva., three-phase subway type transformer designed for 22,000/4,000-volt Y with four 2½ per cent taps below and two 2½ per cent taps above 22,000 volts, and to have an inherent impedance of 10 per cent. The transformer is equipped with a 22,000-volt, three-pole, three-position disconnecting and grounding switch which is protected by an electrical and mechanical sequence interlock to prevent its operation while the transformer is energized from either side and to control the method of operation. This switch box is oil-tight and is provided with a three-conductor pothead to accommodate the incoming transmission cable. The 4,000-volt leads are brought out through oil-tight bushings so constructed that an oil circuit breaker cubicle can be bolted to the transformer case, making a water-tight connection. The transformer with the switch box cover removed is shown in Fig. 2. This switch is a new design employing large porcelains for the mechanical and electrical duty. The oil level of the transformer is above the switch box and interconnected by two pipes so that there is no air space above the switch. This eliminates the most serious danger of explosions within the switch compartment.

2. Three single-phase, oil-immersed, subway-type, 200-amp., 2,300-volt, 5 per cent buck or boost regulators are used at each unit. The motor, control and transformer for the motor circuit are mounted within the housing of the regulator and this is equipped with wiping sleeves for cable entrance. In addition to the contact-making voltmeter control, the regulator has standard resistance and inverse reactance compensation. One of these regulators is shown in Fig. 3. These are the first self-contained submersible regulators ever built and provide accessibility for adjustments and a visible operation indicator.

3. Welded sheet steel cubicles, reinforced to withstand pressure when submerged, house the oil circuit breakers. These cubicles were built in the Duquesne Light Company shops. Doors of cubicles used in the underground vaults, bolted on and gasketed, are thus made water-tight and are equipped with heavy glass windows to permit viewing relay operation indicators and breaker operation counter. Handhole covers are included for resetting relays and for manual operation of the breaker. Doors of cubicles used in a small building or outdoors are hinged and equipped with locks.

Oil circuit breakers are 600 amp., 7,500 volts and will rupture 14,000 amp. at 4,000 volts with the standard duty

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†Senior engineer Byllesby Engineering & Management Corporation, Pittsburgh.

‡*The economies and design principles of this network were described in an A.I.E.E. paper presented by Messrs. R. M. Stanley and C. T. Sinclair before the Pittsburgh district meeting, March 11, 1931, and abstracted in the "Electrical World," March 14, 1931, page 496.*

Fig. 2—Submersible transformer in 1,500 kva. rating
Cover of 22-kv. switchbox removed.

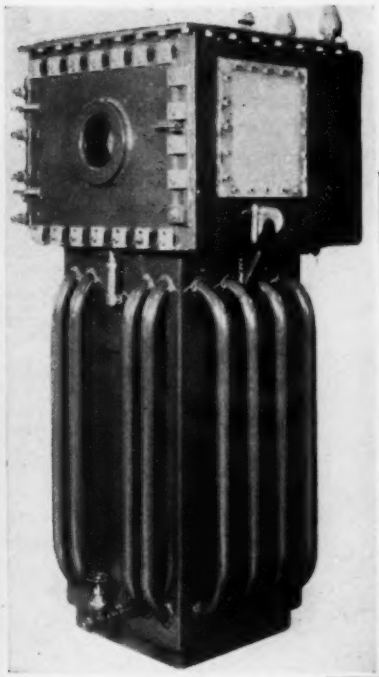

Fig. 3 — Regulator self-contained and also submersible

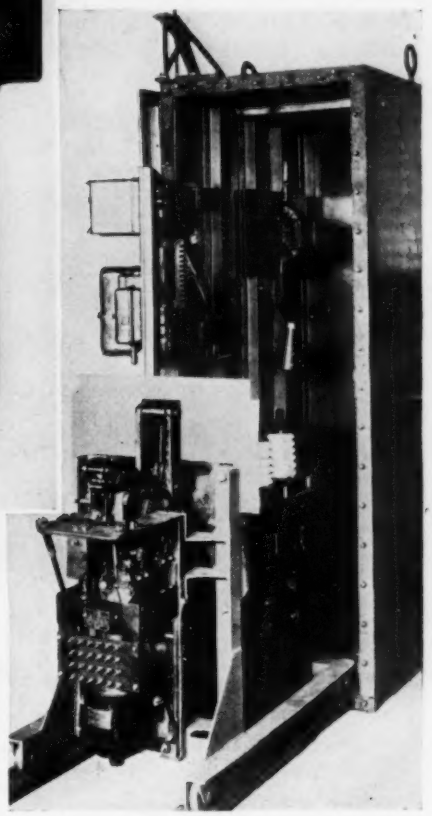

Fig. 4—Switching unit for 4 kv. in submersible design
Relay panel swung out. Truck-type breaker partly removed. Rubber cone over lead to switch avoids necessity for taping.

cycle. Breakers with their motor-operated mechanisms are mounted on a truck.

In addition to the oil circuit breaker the cubicles contain all necessary relays, current transformers, a potential transformer in case of transformer cubicle, bus connections and submersible potheads. The leads connecting to the breaker are protected with rubber cones to eliminate the necessity of taping and its corresponding expense necessitated when removing the breaker truck.

Barriers are provided between the bus connections and the relay panels to protect a man working on the relays from any accidental contact with the 4,000-volt leads.

Installations made in three types

Three types of transformer units were considered, and in order to obtain comparative construction and maintenance costs and operating experience with each type the initial installation included one of each, namely, underground vault, small building and outdoor type.

The underground street vault (Fig. 5) is one of the largest ever built, having inside dimensions of 12x31 ft. and a headroom of 13 ft. The ventilators extend under the sidewalk area and are used as a means of access to the vault. It was necessary to build up the hatchways and ventilators several feet above the ceiling of the vault, since the definite elevation of the street has not been determined by the borough engineer. Due to the heavy hydrostatic pressures that may develop during flood periods and the requirement for street loads of 1,000 lb. per square foot it was necessary to taper the walls to a maximum of 27 in. and substantially to reinforce them with steel rods. The barrier wall type of construction is the same as is used in the low-voltage network and protects the tie main and its protective equipment from any danger of a transformer failure. The transformer compartment has four removable hatches, giving a clear opening of 8x10 ft., and the tie main compartment has one opening, 4x5 ft. Each compartment has a sump hole and pipe connection to the vault entrance for ease in removing excess water which may accumulate in the vault. The street has a slag surface and the edges of the concrete hatchways are protected by a ledge of "Road O'Mal," a tar compound which can stand up under vehicular traffic, and prevent chipping.

The small building (Fig. 6) used at the Oakmont unit is identical to the underground vault as to size, barrier-wall type of construction and equipment layout. The end wall is equipped with louvers and a small thermostatically controlled fan is placed in an outlet to the roof for ventilation of the transformer compartment. A removable bolted-in panel is used over standard height doors to give sufficient clearance for the installation of the equipment. The building is an inexpensive structure which harmonizes with adjacent buildings and, with real estate, cost less than an underground vault.

The outdoor installation at Verona (Fig. 7) requires a concrete pad 8x33 ft. Bus and control wires are supported on a steel framework with metal barriers between phases and between bus and control leads. A simpler layout of the equipment is possible in this scheme in which there is no need of a barrier wall.

For the initial installation bus differential protection was included, but it may be feasible to eliminate this in future designs and substitute a simpler scheme which will give the same protection.

The transformer oil circuit breaker, with the current transformers on the transformer side of the breaker, is equipped with a standard low-voltage network relay which functions as a low-energy directional relay. In series with this relay is a time-delay relay for low-current operation and shunted across it an overload relay for instantaneous operation for high currents. With this arrangement the transformer oil circuit breaker is opened after

Fig. 7—Third unit is an outdoor installation

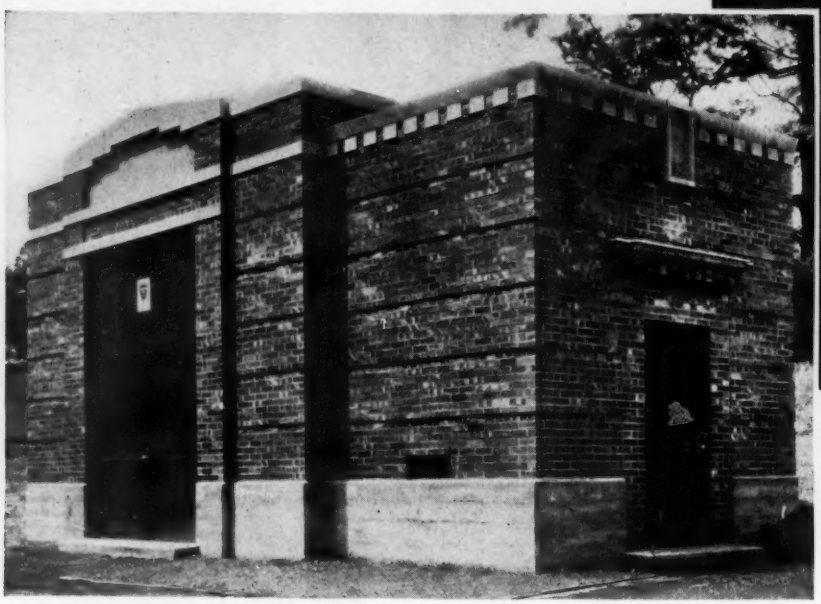

Fig. 6—Building duplicates vault dimensions

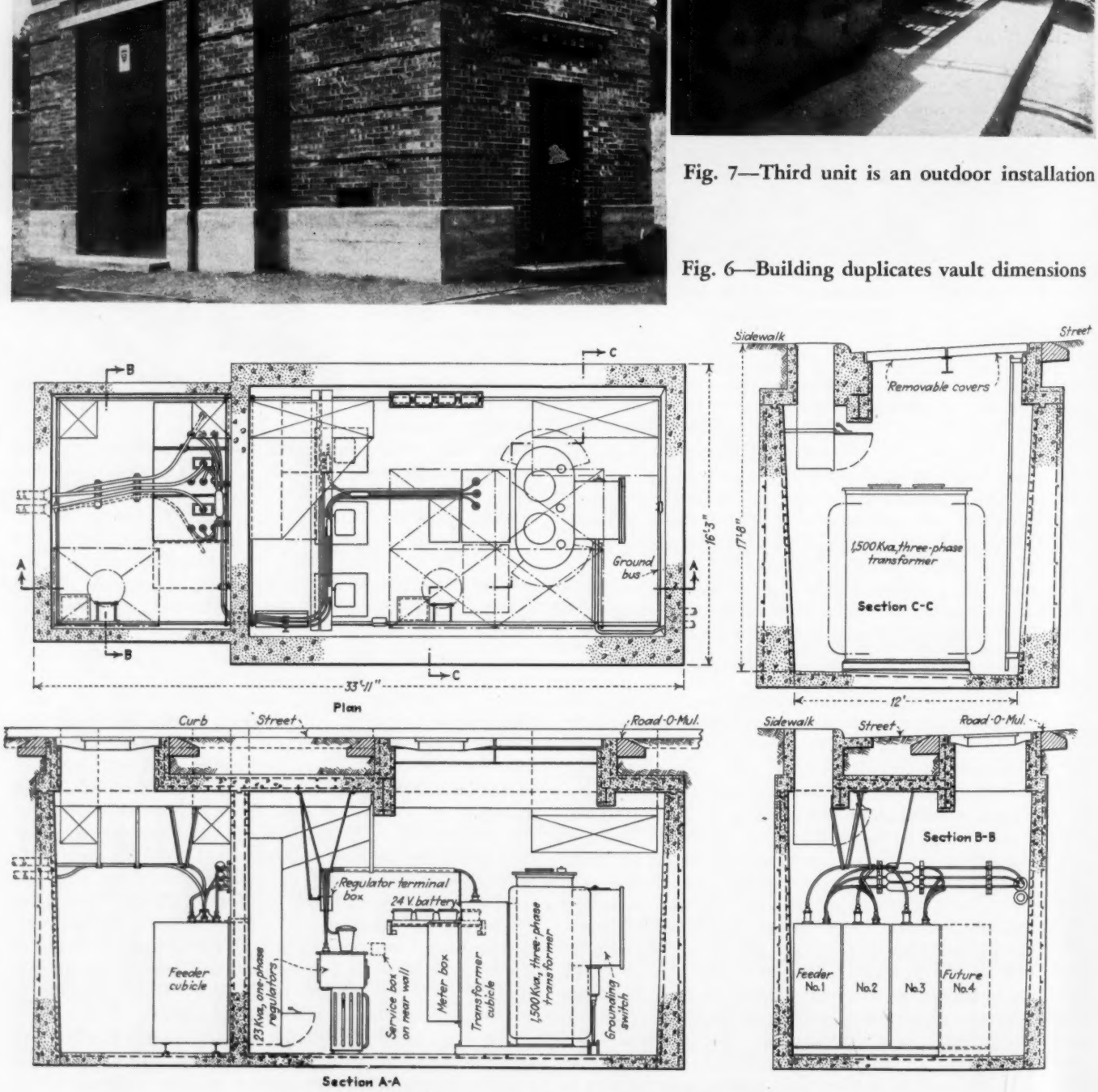

Fig. 5—Thirty-four-foot vault under sidewalk and street

fifteen seconds when a low value of current such as magnetizing current of the transformer is flowing from the network into the transformer. The breaker will open instantly in case of a high value of current due to a fault in the transformer or transmission lines. Power to operate the motor-driven reclosing relay and the motor-operated mechanism of this transformer breaker is supplied from a small 1½-kva. transformer connected to the 4,000-volt leads of the transformer. The time is set for three automatic reclosures at three-minute intervals. However, the reclosing cycle is inoperative until such time as the transmission line is restored to service.

Inverse time on tie main breakers

Each tie main oil circuit breaker with the current transformers on the line side of the breaker is equipped with inverse time overload relays. The characteristic of the relay has a greater inverse time element than the normal relay. For example, on the present settings there is eight seconds difference between the time of operation at 400 and 600 amp. and four seconds between 600 and 1,300 amp. This gives ample protection for the currents to be cleared on the mains. Each of these breakers is equipped with a motor-driven reclosing relay and set for one reclosing. Such relays are set for 30 seconds on one end of a tie main and 60 seconds on the other, thus giving the tie main an equivalent of two reclosures.

A duplicate set of control switches and indicating lamps is mounted in a control box in the outlet air ventilator shaft. They are accessible from the sidewalk and make it possible to operate any of the oil circuit breakers without entering the vault.

Oil circuit breakers are wired for supervisory indication and through a telephone pair it will be possible to indicate in the system operator's office the position of all oil circuit breakers on the network. It is planned in the near future to add this feature.

A station service bank consisting of three 1½-kva. transformers supplies the voltage elements of the network relay, the motor mechanisms of the tie main oil circuit breakers, control lights, lighting for the unit and a rectifier for charging the 24-volt battery used for breaker tripping.

In order to record the output of each transformer a kilowatt-hour meter is installed. A recording ammeter is provided in each phase lead of the transformer and a recording voltmeter is also provided which can be connected by means of suitable switches to record the voltage on any phase, either before or after the regulators. Each tie main cubicle is equipped with three small indicating ammeters which are visible through glass windows.

Two subsequent articles will record the operating experience with the network system.

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Demonstrating Applications to the Farmer

By E. C. EASTER

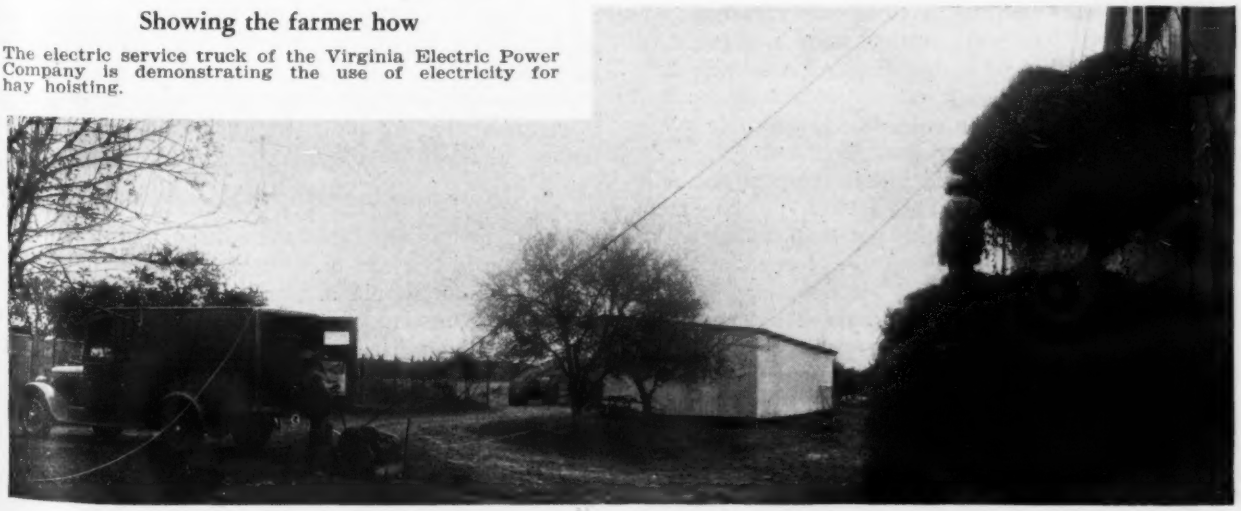
Chairman Rural Electric Service Committee, Southeastern Division, N.E.L.A.

After building rural lines at an average rate of about 400 miles per year from 1924 through 1929 the Alabama Power Company observed that this rate of expansion could not continue and concluded that greater efforts would have to be made to increase the consumptions of individual customers. The proposition was accepted that any farm customer can make electric service pay its own way through various rather inexpensive uses of electricity. During the fall and winter of 1930 and 1931 the company held a series of 67 meetings in rural communities at which these profitable uses of electricity were discussed. These meetings were attended by about 7,000 people and were followed by personal contacts in each community. During this contact work, which was continued through 1931, pictures of installations were made and records accumulated showing the profits of electrical use. Slides were made from these pictures and data and during the winter of 1931-1932 84 meetings were held in the same and additional communities and were attended by 12,000 people.

As a result of this work the customers are more familiar with the company and its interest in the farmers of the state. They have learned to understand the rates at which they are served. To the company this work, together with other activities, resulted in an increase of kilowatt-hour sales to rural customers of 949,117 kw.-hr. in 1931 over 1930, an increase of 19.5 per cent of energy consumption with an increase of only 6.5 per cent in the number of customers served.

Showing the farmer how

The electric service truck of the Virginia Electric Power Company is demonstrating the use of electricity for hay hoisting.



Selling Salesmen on Air Conditioning

Full and profitable development of air-conditioning loads will require close co-ordination between the manufacturer and power company salesmen. The latter must command a fundamental working knowledge of the various systems and equipment if they are to sell air conditioning effectively.*

EMERGING from the chrysalis of a highly specialized application, groomed in research and developmental laboratories for service in the domestic, commercial and industrial fields, air conditioning flings a challenge at falling load curves which intrigues not only the power salesmen but every member of the electrical industry. To them will fall the responsibility of selling the idea of, and creating the desire for, this modern living comfort.

Air conditioning is not complex, nor does it involve equipment of radically new design, but rather a grouping of standard equipment into a system which will produce desirable living conditions within a prescribed area. To obtain maximum results, from the load-building standpoint, the entire industry, from the salesman to the plant operator, should be familiar not only with its possibilities as a revenue producer and business builder but also with the essential fundamentals of the mechanical installation, together with the operating cycle and results possible from various types of installations.

Temperature, humidity and air movement

Temperature, cleanliness, humidity and air movements are the four atmospheric factors which most affect the comfort of human beings. As all these factors vary through wide ranges and cannot be considered ideal except during a relatively few days of the year, it is necessary artificially to create correct conditions by mechanical means if maximum comfort is to be experienced. Although equipment has been available for a number of years for conditioning large buildings, it was not until recently that air conditioning, either from a mechanical or price standpoint, has been considered applicable to the home, office and small industrial establishment.

The average person considers that temperature only affects his bodily comfort. This is true to the extent that temperature determines the potential radiation of heat from the body. Qualifying the foregoing statement by the inserting "potential" is necessary because humidity changes will produce the same sensations of heat and cold as will temperature changes. If the humidity is raised, evaporation from the body is decreased and a sensation of heat is produced. Likewise, lowering the humidity tends to increase evaporation and produces a sensation of coolness. Bodily comfort also depends upon movement of the air, the more rapid its movement the greater being the evaporation and cooling sensation produced.

There are a number of different combinations† of temperature, humidity and air motion that will produce the same effect of bodily comfort. Effective temperature is a term which has been coined to denote combinations of these three factors which produce the same results. Effective temperatures which constitute comfortable conditions are termed the comfort zone, and it is the function of air-conditioning equipment to adjust temperature, humidity and air motion so that the effective temperatures will be maintained within its limits.

From actual tests it has been determined that most people feel comfortable between 62 and 69 deg. F. effective temperature. This does not imply that it is necessary to cool a room to an actual temperature of 69 deg. F. or below. This is neither desirable nor economical, as a person would experience a definite shock and chill in going from an outside temperature of 95 deg. into a room at 70 deg. Under such conditions the room temperature should be maintained at about 80 deg. (or about 15 deg. less than outdoors) and the effective temperature within the comfort zone should be obtained by decreasing the humidity and increasing the air motion to produce the sensation of coolness. Thus, in the practical application and use of air-conditioning equipment, consideration must be given to the outside temperature.

A further factor affecting bodily comfort and well-being is the cleanliness of the air. It is estimated that there are 115,000 particles of dust per cubic inch of ordinary city air. Each grain of this dust carries an enormous number of germs which are a potential menace to the health of those who breathe the air. Dust is classified as poisonous, irritating, infective and obstructive, and may be of animal, vegetable, mineral or metallic origin. To promote maximum bodily comfort and well-being it is essential that all air used in buildings be filtered to remove as much of this suspended matter as possible.

Air-conditioning equipment and its functions

From the foregoing discussion of what constitutes bodily comfort it can be seen that a complete air-conditioning system should accomplish the following results: Remove the dust and dirt from the air entering the building, cool the air in summer, warm the air in winter, increase or decrease the moisture content of the air (relative humidity) as required, ionize or ozonate the air and circulate the air uniformly throughout the building at all times.

The cycle of a complete air-conditioning installation

**Abstracted from the Air-Conditioning Manual prepared by the Pacific Coast Electrical Bureau.*

†See air-comfort chart, page 1100, June 25, 1932, "Electrical World."

consists of filtering, washing, humidifying, heating (or cooling) and ozonating outside air before passing it through the distribution ducts in the building. The apparatus necessary to accomplish this falls into the four following groups:

Fresh Air Supply	Filtering, Washing and Conditioning	Distribution and Recirculation	Control
Air intake and fan	Air filter	Distribution ducts	Temperature control
Mixing chamber	Air washer	Exhaust ducts	Humidity control
Tempering heater	Preheaters	and fan	Fan switches
	Cooling unit		
	Ozonation		
	Ionization		

The fresh air supply should be drawn from out-of-doors through an intake which is located so that dust, dirt and fumes from the street will not be excessive. As it is generally desirable to recirculate a portion of the warm air through the building to reduce operating costs, the incoming fresh air is mixed in a mixing chamber with that taken from the exhaust duct of the building. In some localities the outside air has a very low temperature during the winter and might freeze water used in the air washer spray unless it is heated. This is accomplished by a heater installed between the mixing chamber and the air filter.

Filtration requirements include the maximum removal of dust and other particles in the air, minimum resistance to air flow, minimum attention to reduce the cost of cleaning and maintenance, and a capacity sufficient to retain large quantities of dust. Air filters are of two types, designated as the dry and the wet or viscous type, the latter being arranged either for manual or automatic cleaning. Dry filters may be either the permanent filter type, which accumulates dirt that is later removed by vibration or pneumatically, or the renewable type, in which the cleaning is effected by replacing an inexpensive filter medium after it is loaded to its capacity. Wet or viscous type air filters utilize the adhesive impingement principle of dust elimination. In some varieties of this type densely packed layers of viscous-coated metal baffles or crimped wire, inserted in the path of the air, divide the latter into minute streams, which are constantly forced to change their direction. Each change of direction forces the heavier-than-air duct particles against the viscous-coated surfaces, where they are caught and held. These filters may be either of the manually cleaned or automatic cleaning type. The former usually consists of a series of frames or cells which may be individually cleaned by immersing in a solution of hot water and washing soda or other cleaning compound. The self-cleaning type of wet filter generally provides some method of flushing the cells by rotating them through an oil bath. It is particularly suitable for heavy dust conditions.

Generally speaking, there are three types of air conditioners. The first is known as the air washer and is

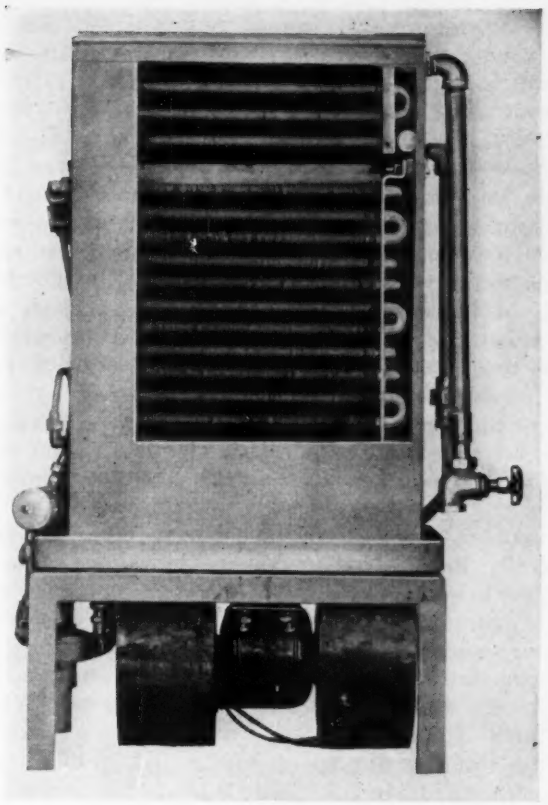


Fig. 2—Complete assembly of a vertical type air conditioner

At the top are the heating coils, below which are the cooling coils and circulating fan. The compressor is located elsewhere and is not shown.

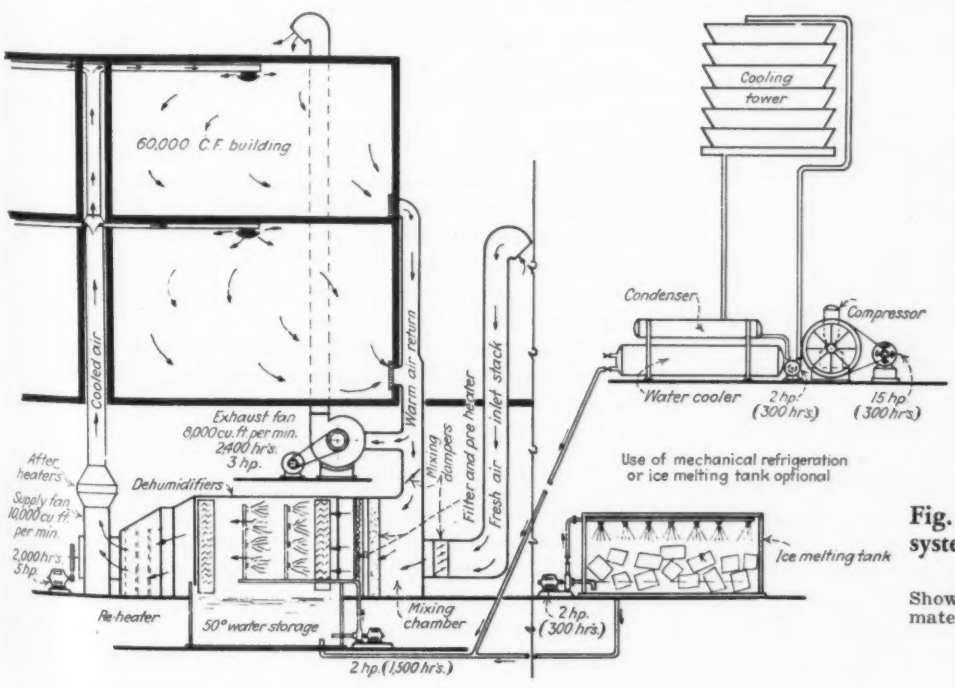


Fig. 1 — Air-conditioning system for a 60,000-cu.ft. building

Shows the equipment and estimated hours of use during the year.

used in large central installations where a relatively high volume of air is to be conditioned. In this type of air washer a water spray is placed in the air passage. By controlling temperature of the water spray through automatic means the air can be brought to the proper condition of humidity.

The second type is the unit spray air conditioner, which provides a complete assembly in a single unit of all the component parts of the air washer. In this unit means are provided for washing, humidifying, dehumidifying, heating and cooling the air with the proper control equipment. Air distribution can be accomplished by cowls as a part of the unit or with ducts attached to the unit fan assembly.

A third type is the coil conditioner, which omits the water or brine spray and consists merely of a coil, carrying the refrigerant, which is inclosed in the cabinet and connected to a fan assembly that distributes the air through the cowls or ducts connected to the cabinet. Naturally the coil-type air conditioner cannot be used to regulate humidity conditions closely, although it effectively maintains low humidities and condenses excess moisture when operated with comparatively low refrigerant temperatures and can maintain high humidity conditions by using comparatively high refrigerant temperatures.

After passing through the filter and washer the air is preheated to a relatively high temperature under the control of automatic thermostats. In mild climates the preheater may be the only heater necessary or it may be supplemented by an after-heater, which is generally the largest of the three heaters used in the system. Heaters may be of the steam, hot water or electric type.

Ozone is recognized as an effective deodorizer when applied to ventilation. In addition to its deodorizing properties, it has a freshening effect on the air if introduced in approximately the same concentration as it occurs in air and its natural unpolluted condition. Air also is freshened by ionization, which term, applied to ventilation, means the ionization of oxygen in the air. In an ionized condition oxygen keeps up its fight against the organic contamination in the air and functions as a bodily cleanser, upon which function life is dependent.

Ozone and ionization should not be confused. In air conditioning a definite amount of ozone should be introduced into the ventilating system for deodorizing and freshening. For this reason only apparatus designed to measure and control the gas should be used. Ionization applied to ventilation refers to the condition of all the oxygen in the ventilating system. Scientifically designed and well-constructed machines for producing either ozone or ionization in the amounts required have been started on by manufacturers and should be a part of every good air-conditioning installation.

During warm weather heaters of the air-conditioning system may be inoperative and the temperature of the air regulated in the air washer which is supplied with water cooled either by a mechanical compressor or melting ice. When air has a high humidity it may require excessive cooling to reduce its moisture content. In such cases it is reheated to the correct temperature before distribution. Mechanical refrigeration systems include a compressor and refrigerant which undergoes a cycle of compression and expansion, during which it absorbs heat from the water in the spray system and gives up heat through cooling water taken either from city mains or recirculated in a cooling tower. The mechanical refrigeration system is applicable to large installations which have a high load factor. Where the hot season is short or the use intermittent, or the cost of mechanical refrigeration prohibitive, the use of ice to cool the water has proved very satisfactory. In this type of installation a melting tank is provided and the spray water circulated by means of a motor-driven pump over the blocks of ice. This system is illustrated in Fig. 1. The use of ice for this type of cooling calls for a comparatively small installation cost and needs little attention and maintenance other than an occasional cleaning of the tank.

After the air has been conditioned it is circulated through distribution ducts to various rooms within the building. In the room it is drawn through exhaust ducts back to the mixing damper, where a portion is recirculated and the remainder exhausted to the atmosphere. The exhaust fan is always smaller than the supply fan due to the loss in air delivered to the room from leakage around doors, windows and other places.

Control

Successful air-conditioning systems must have automatic control over the wet- and dry-bulb temperatures. Knowing the wet- and dry-bulb temperatures it is possible to obtain the relative humidity. A relative humidity of 50 per cent means that the air, at a given temperature, contains 50 per cent of the water vapor required to saturate it at that temperature. Obviously, then, the relative humidity depends equally upon the factors of temperature and moisture content and a variation in either alters the relative humidity.

During the heating season the humidity or wet-bulb temperature of the air is maintained by varying the spray water temperature in the air washer. This is accomplished by a thermostat, located in the saturated space of the air washer or in the pan of the spray chamber, which operates controls which determine the mixture of hot and cold water at the suction of the spray water pump. After the saturated air leaves the air washer it is reheated to the proper temperature by heaters controlled by means of a thermostat in the fan discharge before being distributed to the building. Summer conditions require air at a low humidity to speed evaporation. In dehumidifying the air it is passed through the spray chamber, in which the spray water is maintained at a low temperature by the use of the refrigerating mechanism. In warm weather the air will absorb a greater amount of moisture and if saturated must have a part of this moisture removed to obtain comfortable conditions. This is done by chilling or cooling the air in the spray chamber and causing it to relieve itself of excess moisture through condensation. The air is then reheated to the correct temperature, which in turn lowers the humidity further and insures that the air will absorb a large amount of moisture from the room or inclosure.

Load-building possibilities

Illustrative of the power consumption of an average air-conditioning system is the installation shown in Fig. 1. For convenience the equipment necessary to condition the air of a 60,000-cu.ft. building was selected and the annual operating hours of this equipment estimated. Power consumption is shown in the accompanying tabulation.

Annual Power Consumption of an Average Air-Conditioning System

Motor	Hp.	Hours' Operation	Hp.-Hours
Supply	5	2,400	12,000
Exhaust	3	2,400	7,200
Spray	2	1,500	3,000
Compressor	15	300	4,500
Cooling water	2	300	600
Total			27,700

The tabulation does not include any utilization of electric heat for conditioning in the building. Such heaters within the system itself or supplementary to other forms of heat in the rooms of the building are used in many buildings and factories at the present time and their popularity will undoubtedly increase because of their cleanliness and ease of installation and control.

It should be remembered that washing, filtering and humidifying the air may also be supplied to buildings and structures already equipped with a heating installation. In a large number of buildings erected for office, factory, school and home use ventilation systems of various types were installed at the time of erection or at some later period. Many systems of this character can be improved by the addition of some air-conditioning apparatus and often the addition of sufficient apparatus will make them complete air-conditioning units.

One of the greatest difficulties in installing air-conditioning apparatus in a building already erected lies in installing the distribution ducts, space for them not having been provided for in the original plans. They must be installed in the walls and under the floors by cutting into them—an expensive operation—or placed on the inside, projecting into space otherwise used, causing less attractive appearance; again cost has to be considered. Where the ducts are already installed for ventilation purposes or the distribution of heat it is a comparatively simple matter to add some or all of the following air-conditioning apparatus:

1. An air filter to remove the dust, soot and dirt from the incoming air.
2. Air washer for cooling, humidifying or dehumidifying the air.
3. Heaters.
4. Fan blowers where the air circulation is dependent on heat from the heating apparatus.
5. An ice tank or mechanical refrigeration where needed for cooling the water.
6. Return circulation.

As there are thousands of these opportunities it would seem that they are the logical immediate prospects for the power company salesmen. Offers of improvement of present installations are frequently favorably considered when an order for a complete new installation in an old building cannot be secured.

Great possibilities for load building also are contained in the refrigerating unit for small living rooms or offices. This is a simple form of air cooler composed of a small refrigerating unit which either cools the air directly or cools water or other liquids used to wash and cool the air to be circulated. These parts are housed in a cabinet which can be mounted either in the room itself or in some cool place at a distance not more than 50 ft. from the room to be conditioned. A condenser unit, generally of the water-cooled type, must be included if the unit is used in the same room at it is not practical to use an air-cooled refrigerating unit under such conditions because there would be no means of transferring the heat absorbed from the room to a colder body.

In operation the room cooler moves air through a discharge duct or an opening in the cabinet at the rate of from 200 to 600 cu.ft. per minute, the warm air from the room being drawn through a refrigerating coil, where its temperature is reduced and again forced into the room, where the cycle is repeated. A number of manufacturers are making such a unit which operates at 110 or 220 volts using either direct or alternating current, and this particular application offers a wide field of development in homes, small offices and shops.

Typical buildings and shops which are immediate prospects for air-conditioning equipment of one type or another are included in the following list:

Bakeries	Clubs	Libraries
Barber shops	Cotton mills	Mattress manufacturers
Ball rooms	Department stores	Theaters
Broadcasting stations	Drug stores	Office buildings
Banks	Factories	Packing houses
Candy factories	Flour mills	Print shops
Ceramic manufacturers	Food manufacturers	Restaurants
Candy stores	Storage buildings	Schools
Cereal products	Hospitals	Show windows
Chemical manufacturers	Hotels	Homes
	Dairy product plants	Tobacco plants.
	Laboratories	

From the foregoing it will be noted that bodily comfort is not the only benefit attained by air conditioning. In most instances products will be improved through manufacture or storage in correct atmospheric conditions.

Connected horsepower for such buildings ranges from 10 hp. in the case of small buildings or buildings using only an air filter or other essential parts of the system to 5,500 kw. in the case of one thirteen-story office building which is completely heated and air conditioned electrically. Nor is the latter figure considered the ultimate limit of load development for an individual building. In a new building which will be completed shortly it is estimated that the connected load for air conditioning alone will exceed 10,000 kw. With such developments in progress it is not hard to visualize a future of windowless buildings, groups of buildings, or even towns with a complete air-conditioning system giving far more comfortable and healthful conditions than are generally obtainable at present. Such buildings already are in existence, a notable example being the Simonds Saw & Steel Company building at Fitchburg, Mass.

The potential energy consumption from air conditioning is too great to warrant even an estimate of its value. As is the case with most new developments, its general acceptance depends upon the intensity of the sales effort put forth. Its general adoption will bring far-reaching benefits to the entire electrical industry, perhaps to a greater extent than any other single application yet advanced.

▼

Federal Power Sites

According to the Geological Survey, Department of the Interior, the federal government now has reserved 6,579,761 acres of land in 21 states and 447,756 acres in Alaska for future power reservoirs. These are said to be capable of producing 15,000,000 hp. when economic conditions warrant.

Code Stills Tendency to Curtail Street Lighting

By HOWARD SHARP
Manager Lighting Department,
Elmira Water, Light & Railway Company
Elmira, N. Y.

The Code of Street Lighting that was prepared by the I.E.S., properly applied, can be of tremendous value to municipalities, central stations and manufacturers. Street-lighting equipment is generally owned entirely by the central station, thus creating a situation whereby the progress of the art is very largely controlled by central station and manufacturers jointly. This should be a very desirable situation, but, unfortunately, in far too many instances street lighting has been considered as so much hardware, with no real thought as to the problems involved. Where such a philosophy has prevailed the code is a real missionary, preparing the way for improved operating conditions as well as increased light utilization.

The past year has not been conspicuous for street-lighting improvements, but in the southern New York properties of the Associated Gas & Electric Company some relatively excellent installations have been made, mostly in small communities. We feel this is in part due to an aggressive use of code recommendations, in addition to a well-developed promotional plan. One man devotes full time to the task, with a portion of the department head's time available in emergencies. All contracts in force are on file in the central office, together with the complete data on each installation. For the larger cities comprehensive lighting programs have been prepared so that extensions to existing systems are guided along intelligent lines.

For years in our smaller communities the practice has been, in common with the almost universal custom, to install short ornamental standards or to hang utilitarian units too near the street. Consequently, the stress on higher candlepower lamps at higher mounting heights, and in some instances on wider spacings, was considered radical and had to be sold both within and without the organization. Then, too, such a change necessitated changes in maintenance procedure and in methods of hanging overhead units. However, once all details were worked out and the modern installations turned on, the response was invariably enthusiastic.

One of the first of the modernized systems was in the village of Geneseo, N. Y., which village of 3,000 population can safely claim one of the most modern of ornamental systems. The main street, 65 ft. wide between curbs, is lined with two-story buildings. Ten-thousand-lumen lamps are used, mounted 16½ ft. above the street and on an average spacing of 110 ft. Not without some hesitation was the mounting height so specified, because of the low surrounding buildings, but the completed installation shows excellent balance.

In Painted Post, a village of about 2,000 population, the problem was a well-traveled, heavily shaded thoroughfare. The trees were comparatively young, resulting in dense foliage at heights of from 15 to 30 ft. above the pavement. For this reason a mounting of about 18½ ft. was adopted as a compromise between best practice and excessive shading. Six-thousand-lumen lamps were used on spacings varying from 150 to 200 ft., with all units on one side of the street. The thoroughfare is carried over railroad tracks on an attractively designed bridge. The lighting was given an ornamental treatment on the structure, the luminaire and bracket being the same as used on the remainder of the thoroughfare, but attached to ornamental steel poles, with concealed feed wires.

Three other installations of fair magnitude were completed in 1931, one ornamental and two utilitarian. The code principles were applied with great success.

Good lighting installations are not dimmed

It is interesting to observe that this year, when municipal budgets are being scrutinized carefully, these well-designed modern street-lighting systems have proved so satisfactory that no question has been raised as to their value to the community. On the other hand, systems which have not been modernized are being criticised, if not directly, in an indirect way through a tendency on the part of city officers to reduce street-lighting expenditures. In the face of the fact that street-lighting budgets are somewhat less than one-half what they should be, we are forced to the conclusion that if a city doesn't know what good street lighting is, it can be expected to question even that inadequate expenditure. Now, more than ever, must the value of adequate street lighting be stressed and, since adequacy is a relative condition, it is the duty of central stations and manufacturers to make sure that the lighting for which they are responsible meets that requirement. The use of the I.E.S. code should be a major item in such a program.

Simplicity marks both electrical and structural designs

Bridge on High Street, Painted Post, N. Y., lighted with G. E. "Novalux" luminaires, 600-cp. lamps mounted 18½ ft. high. Same brackets used on ornamental bridge poles as on wood poles in the background.

Distribution Transformer Connections for Mixed Loads

By A. R. KNIGHT* and R. O. ASKEY†

TO REDUCE the cost of electrical distribution it is a growing practice to supply lighting and three-phase power load from the same secondaries. Where conditions permit, the 120/208-volt Y system, such as used on secondary networks, presents an ideal and symmetrical arrangement for transformer and feeder loading. However, in those cases in which it is considered essential to maintain 230 volts for motor operation, delta connected secondaries with the lighting load taken from one phase is the alternative most commonly used. With the usual 2,300/4,000-volt Y-connected primaries there are two schemes of connections available for supplying the latter type of secondary. One is to connect the primaries in Y with the neutral open and the secondaries delta and the other is to connect the primaries in open-Y and the secondaries open-delta. These connections are commonly known as Y-delta and open-Y.

The Public Service Company of Northern Illinois has recently found it desirable to install a number of transformer banks for combined light and power service. A detailed study has therefore been made to determine under what conditions the open-Y connection should be used and under what conditions the Y-delta connection would be the most practical. This study is summarized in the following diagrams, which indicate the superiority of the open-Y for a large percentage of the mixed loads usually encountered.

Since one of the limiting features to operation of combined power and lighting transformer banks is the magnitude of the dip in voltage caused by the starting of three-phase motors and the consequent effect on the service to lighting customers on the same secondary, it is essential that the connection be chosen which will give the least drop due to low power factor three-phase currents. In this respect the open-Y connection with the lighting transformer connected to the phase ahead gives better results than either the Y-delta connection or the open-Y connection with the lighting transformer connected to the phase behind. Therefore it was decided to use this connection in all cases where the open-Y banks were deemed advisable.

Contrary to general opinion, the open-Y connection was found to be more economical than the Y-delta for all conditions of loading. This was indicated by a study involving costs of transformers, installation, cutouts, arresters and core losses. The explanation of this result lies in the fact that only two transformers are required for the former, while three are required for the latter, and whereas more kva. of capacity may in some cases be required for the open-Y, the fact that costs per kva. are less in larger units more than compensates for the additional capacity.

While the open-Y connection is more economical so far as transformer costs are concerned and allows less flicker drop than the Y-delta connection, it is open to several serious disadvantages. In the first place the open-Y provides for distribution at essentially 2,300 volts, whereas the Y-delta connection provides for distribution at 4,000 volts. In addition, with the open-Y connection there must necessarily be a high current in the primary neutral. Unless several banks may be installed in close proximity and connected to the proper phases so that the neutral currents will balance out before reaching the main section of the feeder, it is possible that serious unbalancing of the primary voltage may result.

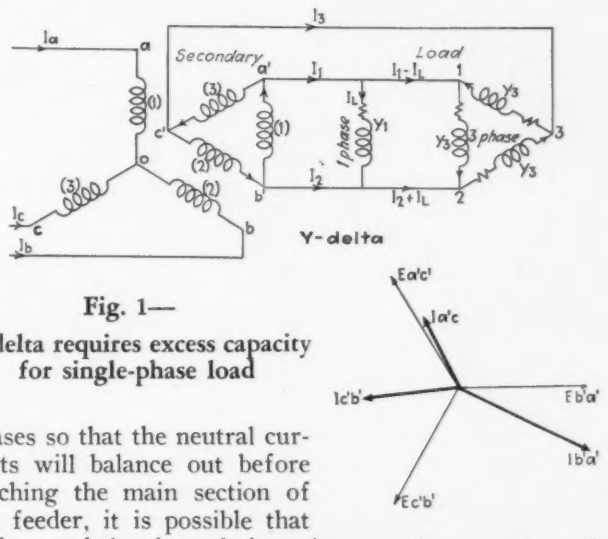


Fig. 1— Y-delta requires excess capacity for single-phase load

In view of these factors it was decided that for the average case, in which unbalancing of the voltages was not serious, the connection requiring the least transformer capacity would be used. For the power factor of 0.95 for the single-phase lighting load and 0.80 for the three-phase load it was found that equal transformer capacity would be required for each connection when the ratio of three-phase load in kva. to single-phase load was 2.56. It was therefore decided that when this ratio was less than 2.56 the open-Y connection will be used and when greater than 2.56 the Y-delta connection will be used. Cases in which there is any possibility of voltage trouble, however, will be given individual study.

This policy has been followed by the Public Service Company for about a year and to date has proved satisfactory. The only difficulties encountered have been those in which proper consideration of the unbalancing effect on long feeders was not given sufficient attention.

Two-thirds of the single-phase load current flows through the transformer on the lighting phase and one-third flows in series through the other two as shown in Fig. 1. The lighting load current in the two trans-

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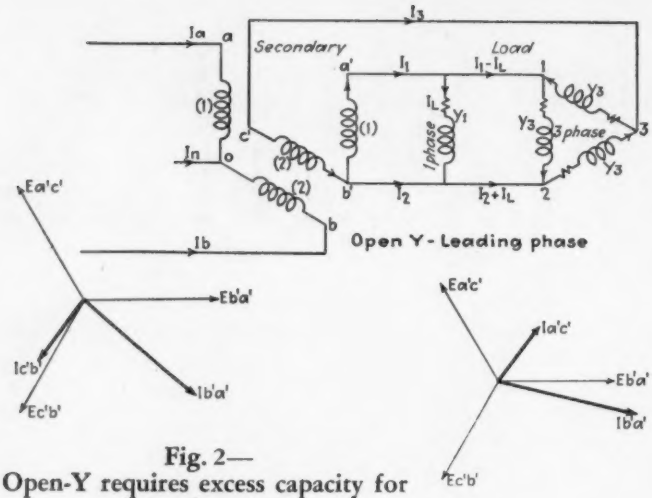
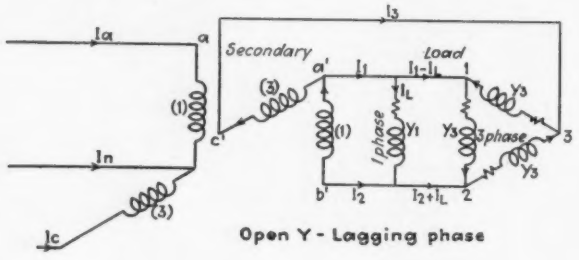


Fig. 2—
Open-Y requires excess capacity for three-phase load



formers here illustrated is at low power factor. The effect of this current division is that the power transformers must be of at least half the capacity of the one on the lighting phase, so far as lighting current is concerned. Thus for serving only a single-phase load four-thirds of the load capacity is required in the transformer bank. This condition changes when single- and three-phase loads are supplied simultaneously, but it remains a limiting one.

The open-Y connection differs from the Y-delta connection in that it provides efficient means of transformation for the single-phase load, but requires excess capacity for the three-phase load. For a unity power factor three-phase load the currents in the two transformers of the bank are 30 deg. out of phase with their terminal voltages. In one transformer the current leads and in the other transformer the current lags the voltage.

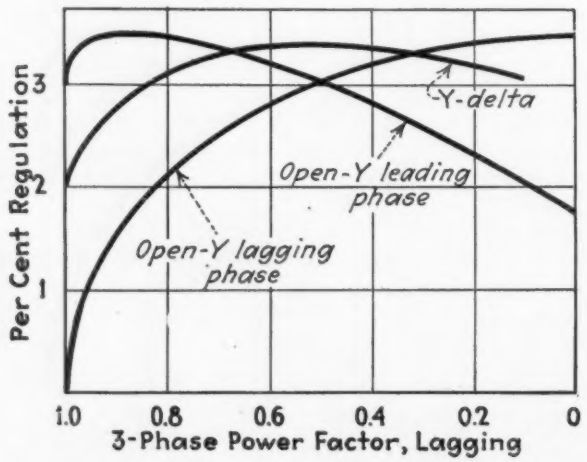


Fig. 3—How power factor affects lighting voltages

Now with a lagging power factor load of 0.8, which represents a fairly average condition, a shift of about 37 deg. is given to these currents. In one transformer the resultant current is only 7 deg. out of phase with its terminal voltage and in the other transformer the current is 67 deg. out of phase.

If the single-phase load is added to the phase in which the three-phase component of current is lagging the voltage 67 deg. the result will be to improve the power factor on that phase. Also, the resultant current will be somewhat less than the arithmetical sum of the component currents because of the large angle between them. The above connection involves connecting the lighting transformer to the phase ahead of the phase to which the power transformer is connected. This condition is shown in the upper diagrams of Fig. 2. If, as the lower diagrams in the same figure show, the single-phase load is added to the phase in which the component of three-phase current is only 7 deg. out of phase with the voltage, the single-phase current and component of three-phase current will add almost directly. The current demand on the power transformer will be the same in either case and, therefore, its capacity. The current demand on the lighting transformer will be less in the first case than in the second because the component parts of its current are combined at a greater angle, which gives a smaller resultant. Thus the total transformer capacity for the bank is less if the lighting transformer is connected to the phase ahead of the one to which the power transformer is connected.

The ordinate of the curves in Fig. 3 is lighting voltage regulation from a bank of transformers serving a mixed single- and three-phase load. The Y-delta connection and the open-Y with the lighting transformer on the lagging phase both show poorer lighting voltage regulation at the low three-phase power factors that characterize the heavy inrush currents of motor starting. While the open-Y connection with the lighting transformer on the leading phase shows poorer regulation at high three-phase power factors, the regulation is much better at the lower ones. Therefore the last connection indicated will be much less likely to allow lighting flicker than the two others.

Sales — Earnings — Customers

The sales job ahead is to increase gross earnings. They come only from the customers, the public—through the cashiers' windows in payment for an increased amount of energy, the use of which has been pleasant. The paramount duty of a utility is to its customers—the public—those large groups whose patronage assures remaining in business and provides for future growth. Their needs and desires must be the first consideration of every public utility—fairly and without discrimination. They are the most valuable asset. Their satisfaction, understanding and appreciation of what electricity will do for them is the major factor in the progress of the industry.

C. A. NASH,
Vice-President United Light & Power Engineering & Construction Company.

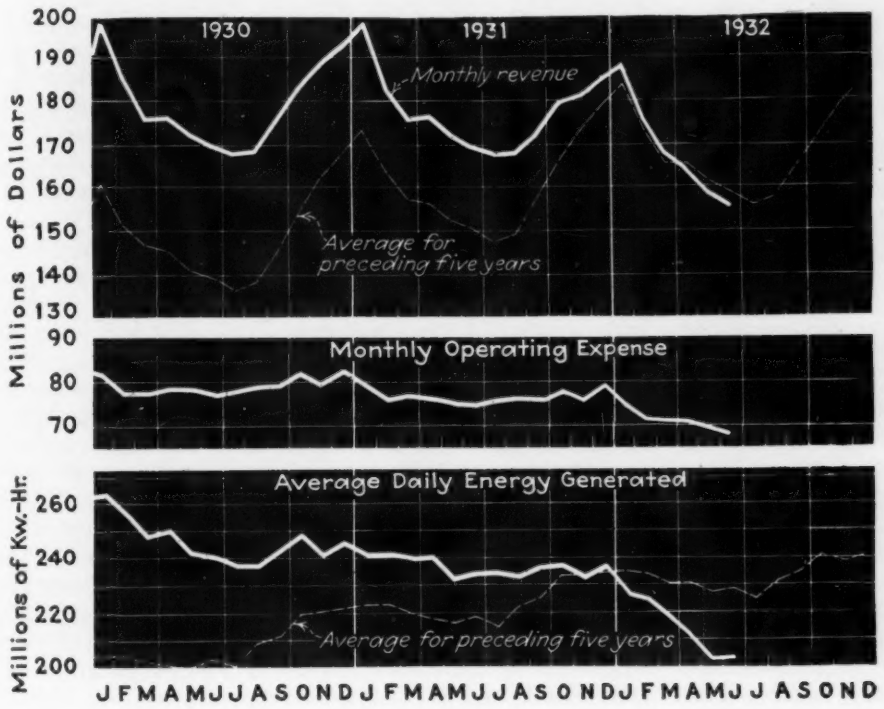
Six Months' Revenue off 5.7 per Cent

CENTRAL-STATION company revenues have been running consistently somewhat under those of 1931, though by a comparatively narrow margin. For the first six months of the current year the total is estimated at $1,010,050,000, compared with $1,071,360,000 in the corresponding period last year. The decrease amounts to 5.7 per cent.

Meanwhile operating and maintenance expenses have also come down, the totals for the same periods being $422,506,000 and $456,070,000, exclusive of such items as taxes and allowance for depreciation, a reduction of 7.2 per cent. This leaves net earnings of $587,544,000 and $615,290,000 respectively, a difference of 4.5 per cent. If it were possible to take account of taxes paid or accumulated the per cent decrease would probably be a little greater. Whatever the financial atmosphere, it is always good growing weather for taxes.

Operations during June resulted in a revenue of $155,490,000, about 2 per cent less than in May, as is normal, and 7.7 per cent less than in June, 1931. The standing relative to last year is therefore the same as it was in May. The revenue continues to be slightly below the month's average during the preceding five years. Operating expenses are down 8.7 per cent and energy output, 6,121,530,000 kw.-hr., is off 12.7. The disparity is due essentially to the continued serious curtailment of the industrial load. Of the decrease in energy production the larger part was in the output from fuel; this is down 16.8 per cent from last year, against 9.6 per cent in output from water power.

Regions on the Atlantic and Pacific seaboards approached last year's revenue more closely than those inland. The greatest reduction, 14 per cent, was in the Mountain States (Table II). Here occurred also the largest reduction in output. Operations in the Central industrial area still lag, with revenue down 10 per cent and output 14.3 per cent.



Revenue, First Six Months

(Thousands of Dollars)

	1932	1931
January	188,010	196,970
February	175,110	182,280
March	168,280	175,840
April	164,860	176,210
May	158,300	171,550
June	155,490	168,510
	1,010,050	1,071,360

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1932	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
March	6,833,168	— 8.0	2,919,523	+17.2	3,913,645	—20.7	1,884,000	+ 6.9
April	6,339,294	—12.1	2,950,757	+ 0.1	3,388,537	—19.7	1,650,000	— 9.0
May	6,210,590	—13.5	2,841,036	— 4.0	3,369,554	—20.5	1,668,000	—10.5
June	6,121,530	—12.7	2,492,805	— 9.6	3,628,725	—16.8	1,660,000	— 3.2

Table II—Regional Operation, Revenue, Energy Output, in June, 1932

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	155,490	— 7.7	6,121,530	—12.7	2,492,805	— 9.6	3,628,725	—16.8
New England	15,680	— 5.5	387,679	—15.5	174,487	—29.5	213,192	+ 1.4
Middle Atlantic	39,940	— 6.8	1,548,631	— 7.2	432,041	— 8.2	1,116,590	— 6.6
East North Central	36,340	—10.0	1,395,902	—14.3	157,254	— 6.0	1,238,748	—15.2
West North Central	13,100	— 7.6	436,145	— 2.5	141,817	+26.5	294,328	—12.7
South Atlantic	17,680	— 5.2	660,073	—18.5	369,287	—17.3	290,786	—20.2
East South Central	5,310	— 8.1	274,859	— 5.0	232,983	— 2.7	41,876	—17.2
West South Central	8,480	— 9.5	344,584	—12.5	8,236	+50.0	336,348	—13.7
Mountain	3,600	—14.0	175,140	—33.0	136,984	—29.7	38,166	+ 9.8
Pacific	15,360	— 6.7	898,517	—13.3	839,826	+16.0	58,691	—81.3

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1932 Thousands	Per Cent Inc.	1932 Thousands	Per Cent Inc.
March	$168,280	—4.3	$70,690	—7.6
April	164,860	—6.4	70,756	—6.7
May	158,300	—7.7	68,070	—8.7
June	155,490	—7.7	67,860	—8.7

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

New Electric Reel Drive Maintains Constant Tension

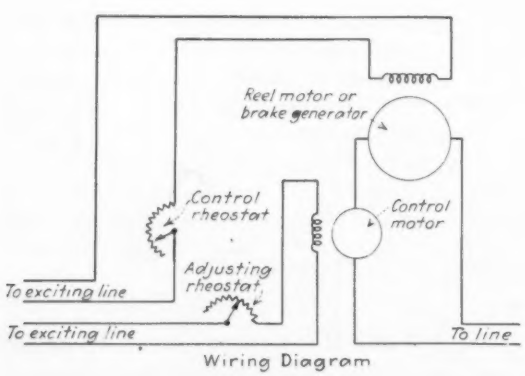
By C. L. PETERSON
Reliance Electric & Engineering Company, Cleveland, Ohio

STRIP steel can now be—in fact in two installations now is being—wound from the mill at a constant tension by an electric reel drive that eliminates the slipping clutch usually employed. The same drive is in use for reeling strip brass in another plant. It can be applied to any continuous materials, such as paper or other fabrics or any strip metal, which are produced at constant speed and are wound at constant tensions on reels. The slipping clutch has held this field for a considerable length of time, not because it is entirely satisfactory but because until now there has been nothing better available.

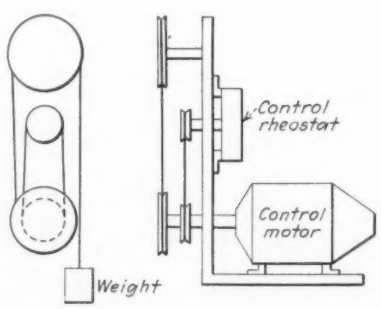
The problem of maintaining constant tension on material being reeled is that of providing a progressively decreasing ratio between the speed and torque of the drive; that is, speed must decrease while torque increases as the accumulation of material on the reel grows in diameter. The slipping clutch performs this function, but must be watched closely at all times. It varies considerably. When first started it is cold. As it warms up it changes and thus varies the tension on the material. Because of the continual wear it must be replaced frequently and maintenance costs are high. The wearing keeps changing the pull of the clutch, which is another reason why it must always be given close attention to keep the tension constant. Here is how the electric drive was developed to eliminate the slipping clutch with its deficiencies and disadvantages.

With constant voltage impressed upon the armature of a d.c. motor the horsepower output varies directly with the armature current. The torque varies directly with armature current and field flux. The speed varies inversely with field flux. Increasing the field current increases the torque and decreases the speed. To obtain constant tension electrically resolves itself into a problem of developing a contrivance which will maintain constant armature current with constant voltage in a motor that must operate at varying speeds.

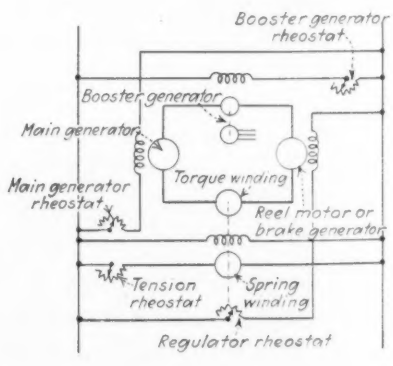
The first device developed was a motor-driven rheostat counterbalanced with a weight. As the elements of this device give a good conception of the factors involved, it is described in the accompanying sketch and caption. It operated, as was expected, in a general way. There were inherent difficulties, however. The weight required considerable space. Because of inertia it had a tendency



Wiring Diagram



Schematic Diagram



Partly mechanical regulator

In the armature circuit of the reel motor (or brake generator, if used for unwinding) is connected the armature of a specially designed, low-voltage torque motor. The torque, or control motor, has mounted on its shaft a pulley to which is connected a cable or chain which passes over an idler pulley and from which is suspended a weight. The control motor is so designed and the weight is so selected that when a fixed value of current is passing through the armature of the reel motor the pull on the cable by the control motor and the weight are equal and opposite and no motion takes place. The control motor has its shaft mechanically connected to the control rheostat shaft. When the control motor rotates it causes the arm of the control rheostat to turn and thus changes the current in the field of the reel motor. The change is of such direction that it tends to correct the armature current of the reel motor and the amplitude is changed continuously to increase or decrease, as the case may be, until the current in the armature of the reel motor returns to the predetermined and desired value.

How the constant-tension drive works

When the drive is in operation none of the various controls need be touched. Everything is automatic. However, should it be desired to increase or decrease the tension on the material it is only necessary to adjust the tension rheostat to permit more or less current and consequently torque in the spring winding of the regulator. The regulator rotates the rheostat, which changes the torque of the reel motor so it will pull at the tension desired. Another rheostat regulates the field of the main generator. When once set it is hardly ever changed. The only other hand-manipulated control is the booster-generator rheostat, which is used to set the booster voltage at the proper potential. Adjustment of this is very rarely required.

to over-run and correct more than was necessary, giving just as bad a result in the other direction as originally caused the change to take place. It was difficult to adjust the weight.

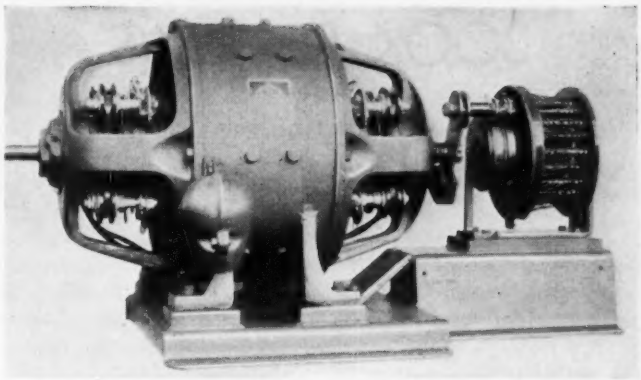
A new electrical device was then developed, called a "constant-tension regulator." This contrivance regulates the current very closely, requires little space, is easy to adjust to meet various conditions, needs very little attention and requires hardly any more maintenance than periodic lubrication. As explained in the illustration and description, it controls the field current of the reel motor in relation to its armature current in such a way as to reduce speed and increase torque.

Adjusting reel speed to production speed

Though the constant-tension regulator will take care of differences due to changing diameter of the coil or roll of material when winding or unwinding, it will not adjust the speed of the reel to suit variations in the speed of the mill.

In order to keep the reel in step at all times with the mill, calender or other machine from which the material is being fed a generator driven by the mill or calender is used to supply the power for the reel motor. Slowing down the main drive slows down the main generator, which in turn supplies less voltage to the reel motor. Consequently the speed of the reel motor is kept in step with the main drive.

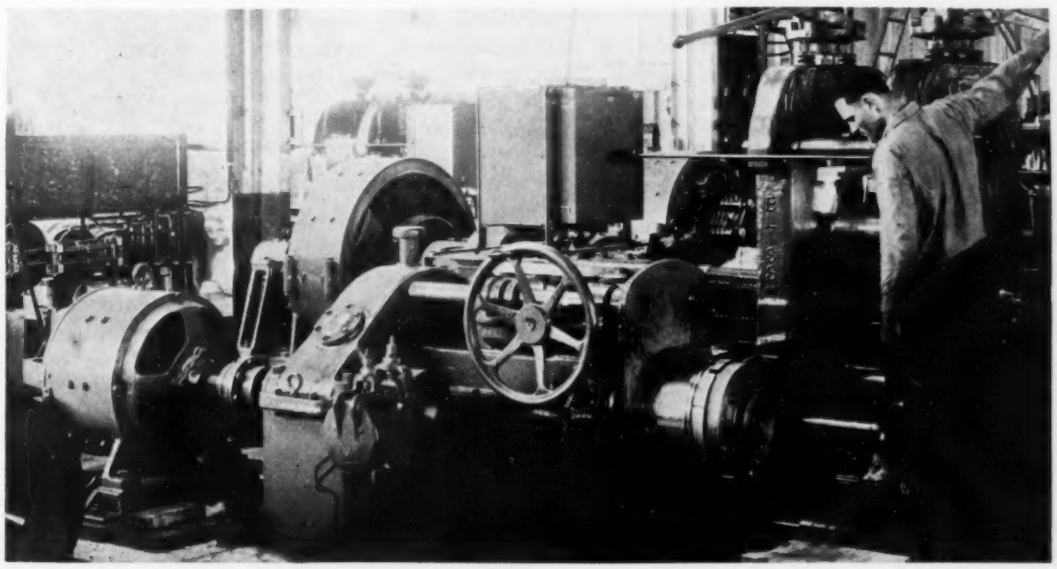
Often it is necessary to stop the reel for inspecting or gaging the material being wound or unwound. During such periods it is essential that the tension be maintained on the material so that it will be kept taut and not unwind. Obviously when the material is not moving the main drive is still and no power is generated in the main generator. Consequently the reel motor has no power to keep the material under tension. Therefore, to supply just enough power to keep the material taut, a booster motor-generator set driven from an external power source is used. The armature of the booster generator is in series with the armatures of the reel motor and main generator. The booster set supplies a very low voltage and runs continuously whether the main drive is operating or not. The assembly of main generator, booster motor-generator, reel motor and constant-tension regulator and their attendant controls constitute the complete constant-tension drive. Its operation is explained in the accompanying connection diagram.



Wholly electrical regulator

The regulator has an armature which is provided with two windings, the "torque winding" and the "spring winding." The torque winding is connected in series with the reel motor (or brake generator if used for unwinding). The spring winding (so called because it acts in a direction opposite to the torque winding like a spring) receives its power from the main line. When the torques of the two windings are equal there is no movement of the regulator. If, for instance, the current in the reel motor and hence in the torque winding increases, the torque of the torque winding overcomes that of the spring winding and the regulator rotates. In so doing the field rheostat coupled to the regulator shaft is rotated and corrects the voltage to the field of the reel motor to such a degree that it will bring the reel-motor armature current back to the desired constant value.

When the tension is once set it remains constant automatically for any speed of the material. No further adjustments are necessary. Tensions over a wide range may be had for any and all speeds at which the material is moving. These drives have been developed for backstands of paper calenders and other machines where a braking action is essential when unwinding. The heat of friction brakes, which are generally used for this purpose, is eliminated. The energy generated is either dissipated in resistors or saved by pumping back into the power lines. The tension can be kept just as constant for unwinding as winding.



Constant-tension drive in operation

This drive is used for winding strip steel and has proved far superior to the old slipping-clutch type used for doing similar work on many other machines in this plant.

BOOK REVIEWS

House Design, Construction and Equipment

By President's Conference on Home Building and House Ownership, Washington, D. C. 325 pages. Price, $1.15.

An excellent book for the general public which the electrical industry might well afford to bring to the public's attention for the information it contains on electric wiring and utilization, to which nearly 9 per cent of the book is specifically devoted. The remainder of the book is devoted to discussion of dwelling design, construction and fundamental equipment, including heating, ventilation and air conditioning, plumbing and sanitation and refrigeration. This book develops in the lay reader a better conception of the part which electricity plays in his convenience and comfort, the inadequacy of most wiring layouts and utilization and the unique advantages of electric lighting and such devices as ranges, refrigerators, washers, ironers, etc., so that he should have a better appreciation of this value and the need of adequate circuits and outlets. Sections are devoted to local sources of information, service obtainable from utilities, wiring methods, costs and inspection, relative costs of knob and tube and conduit wiring with different size wires, per cent of structure cost for wiring average cost per outlet, wiring specifications, lighting requirements and fixtures, and wiring and lighting rural homes.

It is a book which should be placed in every householder's hands.

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Engineering Reports

Volume II (Bell—N.E.L.A. Joint Subcommittee on Development and Research). National Electric Light Association, 420 Lexington Avenue, New York, N. Y. 296 pages, illustrated. Price, $11.25.

In April, 1930, there was published the first volume of reports on the co-operative co-ordination of power and telephone systems. The present volume reports on projects, fully or partially completed, in the fields of noise frequency co-ordination and of low frequency and structural co-ordination. Of course it goes without saying that such an authoritative work constitutes a veritable bible for the co-ordination engineer, setting forth the authentic methods of attack, the mutually accepted principles and aims, as well as the data from specific instances and the practical and economic limits to amelioration measures. It is replete with formulation, charts and diagrams.

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Einführung in die Theoretische Elektrotechnic

(Introduction to Electrical Theory)

By K. Küpfmüller. Julius Springer, Berlin W9, Linkstrasse 23-24. 285 pages, 320 illustrations. Price, paper 18.00 reichsmarks; bound 19.50 reichsmarks.

As the title implies, this is a mathematical treatise, primarily for the instruction of students in advanced technical colleges. By taking for granted a familiarity with such intellectual tools as the theory of vector potentials, spherical and cylindrical co-ordinates, much ground can be covered. The author's purpose is to familiarize the reader in a continuous course of study with the concepts and methods that ought to be a part of the general education of every engineer interested in the advancement of the electrical art. The subject-matter therefore includes the Maxwellian equations, electromagnetic waves, tube amplification, and transients.

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Large High-Tension Electric Systems

Proceedings of the 1931 session of the International Conference. Published in French by the Conference, Avenue Marceau 54, Paris. Three volumes, 2,500 pages, illustrated. Price, 380 francs.

Volume I embraces generation and transformation, Volume II construction and insulation of lines, Volume III the operation and protection of the systems. In all there are 100 papers and the stenographic record of the discussions on them emanating from the 36 countries which participated in the conference.

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Handbook of the National District Heating Association

Published by the National District Heating Association, Greenville, Ohio. 530 pages, illustrated. Price, $5.

Many electric utility men are prominent in the association which sponsors this handbook and have contributed to it out of their labors and experience. Opening with much data on weather, insulation, steam consumption, etc., it then discusses the heating system in the building, the distribution system for the steam, the district plant, metering, rates and the economics of steam heating. It is a high caliber engineering-economics handbook which should prove indispensable to those who see a future for district heating as an appropriate adjunct of light and power service.

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Electrical Year Book, 1932, of Czecho-Slovak Electrical Association

Editor, Ing. B. Parez. 320 pages, with diagrams, illustrations and colored map. Published by Elektrotechnicky Svaz Ceskoslovensky, Vocelova ulice 3, Praha XII, Czechoslovakia. Price, ké. 200.

This is the authoritative source of information on the electrical industry in Czechoslovakia. The present edition, for 1930, gives even more statistical data than before, while other material has been somewhat abbreviated.

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Berechnung Von Drehstrom-Kraftübertragungen

(Computation of Three-phase Power Transmission Lines)

By Oswald Burger. Julius Springer, Berlin. 183 pages, 55 illustrations. Price, 12 reichsmarks; bound, 13.50 reichsmarks.

The object of this volume (second edition, thoroughly revised) is to set before the transmission engineer the theory and practical methods for computing power lines, short and long. The author has for many years been a transmission specialist with a prominent German electrical manufacturing company. In general the derivation of formulas is followed by the solution of numerical problems. In certain cases tabular methods are shown that have been found practical. Charts and tables facilitate computation. For very long lines the solution by means of hyperbolic functions is explained.

Men of the Industry

E. R. Acker Heads Central Hudson Utility

Ernest R. Acker, for the past seven years general commercial manager of the Central Hudson Gas & Electric Corporation, has been elected president and general manager of that organization to succeed the late Thaddeus R. Beal. Mr. Acker has been identified with the corporation since 1919. He was made superintendent of the Kingston Gas & Electric Company—at that time a unit of the Central Hudson System—in 1921 and held that position until he became assistant to the commercial manager of the Central Hudson Gas & Electric

Corporation in 1925. Later that same year he was appointed general commercial manager. Mr. Acker has been active on committee work in the American Gas Association and is a member of the N.E.L.A.

JOHN L. WILKIE of New York City, who was vice-president of the corporation, was made chairman of the board. Mr. Wilkie, in association with Mr. Beal, was one of the original incorporators of the Newburgh Light, Heat & Power Company, which through 30 years of growth and mergers with other companies in the Hudson Valley has grown to be the present Central Hudson Gas & Electric Corporation. JOHN WILKIE, son of the new chairman of the board, was elected vice-president to succeed his father. He has been associated with the Central Hudson System since 1926. ROBERT B. MCGUINNESS was elected to fill the vacancy on the board of directors.

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E. F. JEFFE, president of E. F. Jeffe, Inc., has been appointed assistant to vice-president in charge of sales of the New York Edison Company and the United Electric Light & Power Company. Mr. Jeffe was formerly an employee of the Brooklyn Edison Company. Following graduation from the Polytechnic Institute of Brooklyn with the degree of electrical engineer in 1916, he joined the Brooklyn Edison Company as commercial engineer and assistant manager of the commercial engineering bureau, remaining in that capacity until April, 1917, when he entered military service. Following his war service he returned to the Brooklyn Edison Company as assistant manager of the commercial engineering bureau, resigning in October, 1923. The following year he managed the Brooklyn Industrial Exposition and served as sales manager of the Kenyon Rubber Company. From 1925 to August 1, 1932, he was engaged in engineering practice as president of E. F. Jeffe, Inc.

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OBITUARY

Russell H. Ballard

RUSSELL H. BALLARD, late president of the Southern California Edison Company, Ltd., whose death was announced in the August 27 issue of the ELECTRICAL WORLD, spent practically his entire business life in the electric light and power industry on the Pacific Coast. As a young man of 22 years who already had seven years of varied experience in the industry to his credit, he went to southern California to grow up with the electrical business of the West. And during his 34 years as a southern Californian Mr. Ballard gave generously of his time and energy to state and civic affairs. As a citizen of Los Angeles he contributed freely toward the educational and cultural upbuilding of his community.

When Mr. Ballard went to Los Angeles, after seven years of work with the Thomson Houston Electric Company of Chicago and its successor, the General Electric Company, the West Side Lighting Company of Los Angeles was a one-year-old concern, just launched on its way to becoming the Southern California Edison Company of today. Mr. Ballard was engaged as bookkeeper. To this position he gave his enthusiasm, youthful vigor and the valuable experience he had gained in the treasury department of the General Electric Company in its general offices at Schenectady, N. Y., and in his work in connection with credits and collections at a number of the company's branch offices, principally the Southern States office at Atlanta, Ga. The West Side Lighting Company was the outgrowth of the Walter S. Wright Electric Company, organized in 1895, and closely followed the organization of the Redlands Electric Light & Power Company in 1892. This latter company is the parent of the Edison company on the hydro-electric side of the family. It was the Redlands company, a year after its organization, that put into operation the first hydro-electric three-phase generating plant in the world.

The year 1897 marked the beginning of a period of change in the hydro-electric and steam-electric utility companies that were formed to serve southern California cities. It was the beginning of a period of consolidations from which, in 1909, the Southern California Edison Company emerged as one of the largest electric utility companies in the United States, with recognized leaders of the industry at its head. From the position of bookkeeper with the young utility company, Mr. Ballard went to the office of auditor, and his advance from then

on was steady, progressing thus: Assistant secretary, secretary, assistant general manager, general manager, vice-president and general manager, executive vice-president and general manager, and president and general manager. He became president of the company in March, 1928, after having been vice-president and general manager since 1924.

As an executive of the Edison company Mr. Ballard had an intimate part in its physical and financial development. He aided its growth to an organization with assets of more than $375,000,000 and 127,000 stockholders and a service that reaches into every nook and corner of a territory of 55,000 square miles. He had worked shoulder to shoulder with the Edison engineers who have built up for the company a combined steam and hydro-electric generating capacity of nearly 1,275,000 hp. in great steam plants and in hydro plants that were built in California's mountains, construction projects that stagger the imagination.

On many occasions Mr. Ballard's organizing and operating genius won the recognition of the electrical industry. He was a past-president of the National Electric Light Association and the Pacific Coast Electrical Association and held membership in the Franklin Institute of Philadelphia. He had been the recipient of many other honors from other organizations and was the first to receive the John B. Miller medal for distinguished service to his own company. Mr. Ballard was born at Hamilton, Ont., 57 years ago.

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J. M. Wakeman

James M. Wakeman, a well-known figure in the electrical industry, died August 24 at Mount Pocono, Pa., after a week's illness. He was 67 years of age. A native of Wolverhampton, England, Mr. Wakeman came to the

United States in 1886 and entered upon a long and successful career in the technical publishing field. After a connection of some years with the Hill Publishing Company and the Sinclair Publishing Company as the Western representative at Chicago of *American Machinist and Locomotive Engineering*, he affiliated himself with the publishing interests of James H. McGraw, as president and general manager of the ELECTRICAL WORLD and the Electrical Engineer Publishing Company, organized later that same year. As general manager of the ELECTRICAL WORLD Mr. Wakeman guided the business career of this publication with rare ability, and when in 1910 he resigned to take a complete rest his departure from the journalistic field was the source of keen regret to the many friends he had made in the electrical industry.

After an absence of 30 months he became active as general manager of the Society for Electrical Development, which was organized at that time. He severed his connection with the society in 1921 and since that time had been traveling extensively abroad. Mr. Wakeman was a member of many societies and associations, including the Engineers Club of New York.

New Equipment Available

Simple and Compact Photoelectric Cell Outfit

A simple and compact photoelectric cell outfit, which can be used in virtually any of the countless applications that are being found for the photoelectric principle, is announced by the Western Electric Company and known as "Photomatic" equipment. The system, designed by the Bell Telephone Laboratories, consists of two small units, one the light unit source and the other a light-relay which contains the photoelectric cell. Both are designed to operate from commercial 50-60-cycle, 115-volt alternating-current supply.

Among the uses to which the system can be applied are counting persons and objects, checking, inspecting and rejecting imperfect samples and regulating production, fire protection and alarm, smoke indication or indication of atmospheric clearness, activating mechanical starters, door openers or closers.

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New Oxygen Absorber

Claiming for it an oxygen-absorbing capacity four times as great as pyrogallic acid, practically equivalent to caustic potash, the Hays Corporation, Michigan City, Ind., announces "Seiz O_2" for use in flue gas analyses. The new absorber is stated to be capable of taking up 50 to 60 times its own volume of oxygen and to maintain its efficiency unimpaired until each cubic centimeter of the charge has absorbed 47 cc. of oxygen. It is said to be unaffected by light, as is pyrogallic acid, and to remain chemically stable over long periods. The new absorber is supplied in Hays gas analyzers now being sold and is available for recharging analyzers at present in use.

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A COMPACT CHROMIUM PLATING UNIT for machine shops that may be moved right into the tool room and immediately connected to current, steam, water and waste outlets has been announced by United Chromium, Inc., New York. It is of sufficient size and versatility to plate the host of tools and parts on which chromium is so useful.

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A PHOTOELECTRIC RELAY known as the "Foto-Switch," designated as a complete but junior model of the more expensive industrial type of photoelectric relays, is announced by G-M Laboratories, Inc., Chicago, Ill. The Foto-Switch is capable of handling commercial applications which do not require the ruggedness demanded of industrial installations, it is claimed.

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Explosion-Resisting Line Starters

Explosion-resisting line starters developed for use in class 1, group D, hazardous locations are announced by the Westinghouse Electric & Manufacturing Company. They consist of standard line-starter units mounted in heavy cast-iron cabinets with wide flanges which are in accordance with the Underwriters' specifications. Deion contactor and combination hand and automatic reset thermal overload relay protection are incorporated in these line starters. The equipment is built both with separate mounted push button and with built-in-push button. Explosion-resisting push buttons for two-wire control, low-voltage release and for three-wire control, low-voltage protection are available.

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Improved Lighting Unit

An improved lighting unit known as the "Titan Luxolite" is announced by the Westinghouse Electric & Manufacturing Company. The outstanding features of the new design include: A cast-aluminum globe seat which furnishes a rigid seating surface for the globe refractor holding ring and eliminates buckling; globe and refractor or globe only may be used with the unit; rigid clamping arrangement makes the unit dust- and weatherproof, and at the same time provisions are made for easy removal of glassware for relamping and cleaning purposes. Other innovations are a new design of a heavy-duty socket, a flexible one-piece globe band, a long skirt on globe seat and the use of weatherproof felt throughout.

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A COMPACT CHRONOMETRIC TYPE POCKET TACHOMETER which can be used, it is claimed, regardless of the rotating direction of the machine whose speed is being measured, is announced by the Jaeger Watch Company, New York. It is not affected by magnetic fields, weather or atmospheric pressure variations and gives instantaneous readings, making it possible to follow all speed variations.